ORDER NO. MTNC010941C1
D6

# Service Manual

Color Television/Monitor/Receiver

## Main Manual

## (NA7D)

**Panasonic**

| Models | Chassis |
|---|---|
| **CT-1388YD** | **JP358** |
| **CT-1389VYD** | **KP358** |
| **CT-2088YD** | **VP360** |
| **CT-2089VYD** | **WP360** |
| **CT-2788YD** | **GP363** |
| **CT-2789VYD** | **HP363** |

This Service manual is issued as a service guide for the models of the **NA7D** family listed above. Included in this manual are a set of schematics, block diagrams, functional descriptions, alignment procedures, disassembly procedures, and a complete parts list.

"**WARNING!** This Service Manual is designed for experienced repair technicians only and is not designed for use by the general public. It does not contain warnings or cautions to advise non-technical individuals of potential dangers in attempting to service a product. **Products powered by electricity should be serviced or repaired only by experienced professional technicians.** Any attempt to service or repair the product or products dealt with in this Service Manual by anyone else could result in serious injury or death."

The service technician is required to read and follow the "**Safety Precautions**" and "**Important Safety Notice**" in this Main Manual.

**Panasonic**®

Copyright 2001 by Matsushita Electric Corporation of America. All rights reserved. Unauthorized copying and distribution is a violation of law.

# Important Safety Notice

Special components are used in this television set which are important for safety. These parts are identified on the schematic diagram by the symbol ⚠ and printed in **BOLD TYPE** on the replacement part list. It is essential that these critical parts are replaced with the manufacturer's specified replacement part to prevent x-ray radiation, shock, fire or other hazards. Do not modify the original design without the manufacturer's permission.

## Safety precautions

### General Guidelines

An **isolation transformer** should always be used during the servicing of a receiver whose chassis is not isolated from AC power line. Use a transformer of adequate power rating as this protects the technician from accidents resulting in personal injury from electrical shocks. It will also protect the receiver from being damaged by accidental shorting that may occur during servicing.

When servicing, observe the original lead dress, especially in the high voltage circuit. Replace all damaged parts (also parts that show signs of overheating.)

**Always replace protective devices**, such as fishpaper, isolation resistors and capacitors, and shields after servicing the Receiver. Use only manufacturer's recommended rating for fuses, circuits breakers, etc.

High potentials are present when this receiver is operating. Operation of the receiver without the rear cover introduces danger for electrical shock. Servicing should not be performed by anyone who is not thoroughly familiar with the necessary precautions when servicing high-voltage equipment.

**Extreme care** should be practiced when **handling the picture tube**. Rough handling may cause it to implode due to atmospheric pressure. (14.7 lbs per sq. in.). Do not nick or scratch the glass or subject it to any undue pressure. When handling, use safety goggles and heavy gloves for protection. **Discharge the picture tube** by shorting the anode to chassis ground (not to the cabinet or to other mounting hardware). When discharging connect cold ground (i.e. dag ground lead) to the anode with a well insulated wire or use a grounding probe.

Avoid prolonged exposure at close range to unshielded areas of the picture tube to prevent exposure to X-ray radiation.

The **test picture tube** used for servicing the chassis at the bench should incorporate safety glass and magnetic shielding. The safety glass provide shielding for the tube viewing area against X-ray radiation as well as implosion. The magnetic shield limits the X-ray radiation around the bell of the picture tube in addition to the restricting magnetic effects. When using a picture tube test jig for service, ensure that the jig is capable of handling **35kV** without causing X-ray radiation.

**Before returning a serviced receiver to the owner**, the service technician must thoroughly test the unit to ensure that is completely safe to operate. **Do not use a line isolation transformer when testing.**

### Leakage current cold check

Unplug the AC cord and connect a jumper between the two plug prongs.

Measure the resistance between the jumpered AC plug and expose metallic parts such as screwheads, antenna terminals, control shafts, etc.

If the exposed metallic part has a return path to the chassis, the reading should be between 240kΩ and 5.2MΩ. If the exposed metallic part does not have a return path to the chassis, the reading should be infinite.

### Leakage current hot check (see Fig. 1)

Plug the AC cord directly into the AC outlet. Do not use an isolation transformer during the check.

Connect a 1.5kΩ 10 watt resistor in parallel with a 0.15μF capacitor between an exposed metallic part and ground. Use earth ground, for example a water pipe.

Using a DVM with a 1000 ohms/volt sensitivity or higher, measure the AC potential across the resistor.

Repeat the procedure and measure the voltage present with all other exposed metallic parts.

Verify that any potential does not exceed 0.75 volt RMS. A leakage current tester (such a Simpson Model 229, Sencore model PR57 or equivalent) may be used in the above procedure, in which case any current measure must not exceed 0.5 milliamp. If any measurement is out of the specified limits, there is a possibility of a shock hazard and the Receiver must be repaired and rechecked before it is returned to the customer.

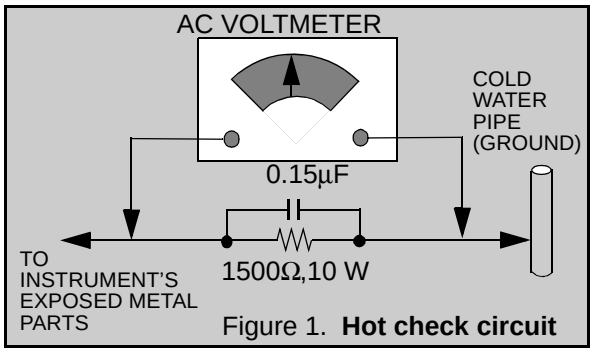



Figure 1. **Hot check circuit**

### X-ray radiation

**WARNING:** The potential source of x-ray radiation in the TV set are the High Voltage section and the picture tube. Refer to **X-RAY PROTECTION CIRCUIT CHECK** in service notes in this manual to confirm HHS voltage.

### High voltage (CRT anode)

Confirm anode voltage is within limits:

Set the BRIGHTNESS, PICTURE, SHARPNESS and COLOR to minimum (to obtain a dark image). Measure high voltage. It should be:

**23.75±1.25kV for 13", 27.70±1.25kV for 20" and 29.25±1.25kV for 27".**

If the upper limit is out of tolerance, immediate service and correction is required.

***Note:*** *It is important to use an accurate, calibrated high voltage meter.*

# Table of Contents


**Important safety notice . . . . . 2**

Safety precautions . . . . . 2
General guidelines . . . . . 2
Leakage current cold check . . . . . 2
Leakage current hot check . . . . . 2
X-ray radiation . . . . . 2
High voltage (CRT anode) . . . . . 2

**Service notes . . . . . 4**

Surface mount chip component . . . . . 4
Component removal . . . . . 4
Chip component installation . . . . . 4
How to replace Flat-IC . . . . . 4

## SPECIFICATIONS

**Receiver feature table . . . . . 6**

## OPERATION

**Location of controls (receiver) . . . . . 8**

## SERVICE

**Disassembly for service . . . . . 10**

Back cover . . . . . 10
A-Board - main chassis (may vary) . . . 10
C-Board - CRT output . . . . . 10
Speakers . . . . . 10
Keyboard push button assembly . . . . . 10
Disassembly for CRT replacement . . . . 10
CRT replacement . . . . . .11
Back cover disassembly . . . . . 12

**Main components location . . . . . 13**

**Chassis service adjustment procedures . . . . 15**

130.0V B+ voltage confirmation . . . . . 15
Source voltage Chart . . . . . 15
High voltage check . . . . . 15

**Purity and convergence procedure . . . . . 16**

**Service adjustments (electronic controls) . . 27**

Sub-Contrast . . . . . 27
Sub-Brightness . . . . . 27
Tint/Color adjustment . . . . . 27
White balance . . . . . 28
Sub-Brightness final adjustment . . . . . 29
Horizontal centering . . . . . 29
Vertical size . . . . . 29
MTS circuit adjustments . . . . . 29
Input level adjustment
(stereo models only) . . . . . 29
Stereo separation adjustment
(stereo models only) . . . . . 30
Clock adjustment . . . . . 30

**Service adjustments (mechanical controls) . 30**

Focus (part of T551) . . . . . 30

## CIRCUITS & BLOCK DIAGRAMS

**Audio signal path block diagram . . . . . 31**

**Video signal path block diagram . . . . . 32**

**Parts list . . . . . 33**

## FOLDOUTS

A-Board layout . . . . . 47
A-Board schematic left CT-1388YD . . . . . 48
A-Board schematic right CT-1388YD . . . . . 49
A-Board schematic left CT-1389VYD . . . . . 50
A-Board schematic right CT-1389VYD . . . . . 51
A-Board schematic left CT-2088YD . . . . . 52
A-Board schematic right CT-2088YD . . . . . 53
A-Board schematic left CT-2089VYD . . . . . 54
A-Board schematic right CT-2089VYD . . . . . 55
A-Board schematic left CT-2788YD . . . . . 56
A-Board schematic right CT-2788YD . . . . . 57
A-Board schematic left CT-2789VYD . . . . . 58
A-Board schematic right CT-2789VYD . . . . . 59
X-Board schematic 13” & 20” voltages . . . . . 60
X-Board schematic CT-2788YD voltages . . . . . 61
X-Board schematic CT-2789VYD . . . . . 62
C-Board schematic 20” & 27”,
layout and voltages . . . . . 63
C-Board schematic 13”, voltages;
H-Board schematic & layout . . . . . 64
G-Board schematic 13” & 20”, layout . . . . . 65
G-Board schematic 27” . . . . . 66
A-Board voltages and waveforms . . . . . 67

# Service notes

***Note:*** *These components are affixed with glue. Be careful not to break or damage any foil under the component or at the pins of the ICs when removing. Usually applying heat to the component for a short time while twisting with tweezers will break the component loose.*

## Surface mount chip component

Chip components must be replaced with identical chips due to critical foil track spacing. There are no holes in the board to mount standard transistors or diodes. Some chips capacitor or resistor board solder pads may have holes through the board, however the hole diameter limits standard resistor replacement to 0.125 watt. Standard capacitor may also be limited for the same reason. It is recommended that identical components be used.

Chip resistor have a three digit numerical resistance code - 1st and 2nd significant digits and a multiplier. Example: 162 = 1600 or 1.6kΩ resistor, 0 = 0Ω (jumper).

Chip capacitors generally do not have the value indicated on the capacitor. The color of the component indicates the general range of the capacitance.

Chip transistors are identified by a two letter code. The first letter indicates the type and the second letter, the grade of transistor.

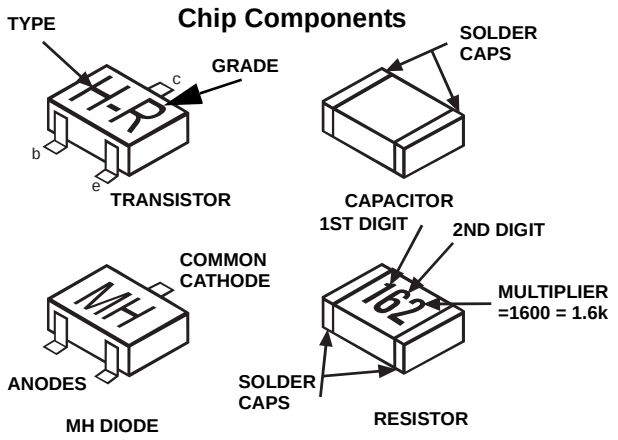
Chip diodes have a two letter identification code as per the code chart and are a dual diode pack with either common anode or common cathode. Check the parts list for correct diode number.

## Component removal

1. Use solder wick to remove solder from component end caps or terminal.
2. Without pulling up, carefully twist the component with tweezers to break the adhesive.
3. Do not reuse removed leadless or chip components since they are subject to stress fracture during removal.

## Chip component installation

1. Put a small amount of solder on the board soldering pads.
2. Hold the chip component against the soldering pads with tweezers or with a miniature alligator clip and apply heat to the pad area with a 30 watt iron until solder flows. Do not apply heat for more than 3 seconds.

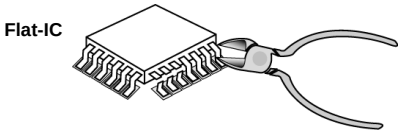



## How to replace flat-IC

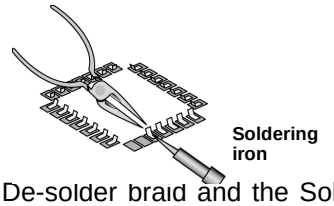
**- Required Tools -**

- Soldering iron
- De-solder braids
- Sharpen pliers (wire cutters and long nose)
- Magnifier

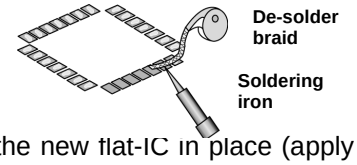
1. Cut the pins of the defective IC with the wire cutters pliers, and remove it completely away from the board. If the IC is glued to the board, apply hot air to complete the removal. **CAUTION**- Do not pull or twist the pliers, may damage the soldering pads in the board.



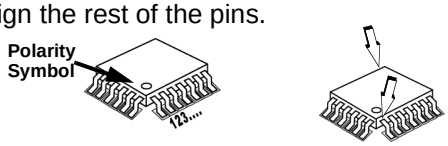

2. Using the soldering Iron and the long nose pliers, remove the IC pins that still attached to the board.



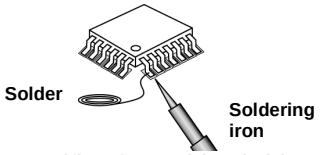

3. Using the De-solder braid and the Soldering Iron, remove the solder from the board soldering pads.



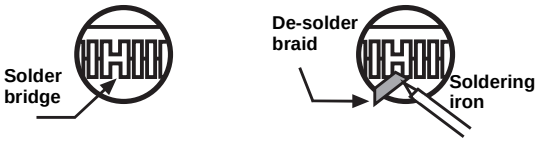

4. Position the new flat-IC in place (apply the pins of the flat-IC to the soldering pads where the pins need to be soldered). Properly determine the positions of the soldering pads and pins by correctly aligning the polarity symbol. Start aligning and soldering Pin No.1, then align and solder the pin in the apposite corner of the IC, this will help to align the rest of the pins.




5. Solder all pins to the soldering pads using a fine tipped soldering iron.




6. Check with a magnifier for solder bridge between the pins or for dry joint between pins and soldering pads. To remove a solder bridge, use a de-solder braid as shown in the figure below.



# Service Notes *(continued)*

**IMPORTANT:** To protect against possible damage to the solid state devices due to arcing or static discharge, make certain that all ground wires and CTR DAG wire are securely connected.

**CAUTION:** The power supply circuit is above earth ground and the chassis cannot be polarized. Use an isolation transformer when servicing the receiver to avoid damage to the test equipment or to the chassis. Connect the test equipment to the proper ground (⏚) or (⏚) when servicing, or incorrect voltages will be measured.

**WARNING:** This receiver has been designed to meet or exceed applicable safety and x-ray radiation protection as specified by government agencies and independent testing laboratories.

To maintain original product safety design standards relative to X-ray radiation and shock and fire hazard, parts indicated with the symbol ⚠ on the schematic must be replaced with identical parts. Order parts from the manufacturer's parts center using the parts numbers shown in this service manual, or provide the chassis number and the part reference number.

For optimum performance and reliability, all other parts should be replaced with components of identical specification.

### X-RAY protection circuit check

This test must be performed as final check before the Receiver is returned to the customer. If voltage is out of tolerance, immediate service and correction is required to insure safe operation and to prevent the possibility of premature component failure.

Equipment needed to check the protection circuit:

1. Isolator transformer.
2. High voltage meter.
3. Short jumper.
4. Diode connection jumper
   *Use similar diode than D823, refer to parts list for part No., (Diode should support at least 150V.)*

Procedure:

1. Connect receiver to isolator transformer.
2. Apply a monoscope pattern.
3. In service mode. (refer to service mode section) select register C0B.
4. Measure TP5 (TPs port close to tuner). Compare the measure of TP5 and set the data for C0B according the following table

| TP5 MEASURE (V) | DATA TO C0B (Hex) |
|---|---|
| 0 ~ 0.93 | 00 |
| 0.93 ~ 0.97 | 01 |
| 0.97 ~ 1.01 | 02 |
| 1.01 ~ 1.05 | 03 |
| 1.05 ~ 1.09 | 04 |
| 1.09 ~ 1.13 | 05 |
| 1.13 ~ 1.17 | 06 |
| 1.17 ~ 1.21 | 07 |

5. Exit service mode and turn receiver OFF.
6. Connect a jumper from TPD16 to TPD17.
7. Connect the *diode jumper*, cathode to TPD14 (COLD GND), anode to TPD15 (HOT GND).

   ***Note:*** *Refer to see Fig. 10 for test point location.*
8. Apply 75 V AC to the AC input of the Insulator transformer.Turn receive ON.
9. Set PICTURE and BRIGTHNESS to minimum.
10. Increase the AC voltage at the input of insulator transformer and confirm the HHS voltage is **29.1KV** for **13", 34.0kV** for **20"** and **35kV** for **27",** at the point set starts to loose sync,
11. Reset picture controls to original levels.
12. Turn the set OFF, and remove all jumpers and connections from chassis.

# Receiver feature table

| FEATURE\MODEL | CT-1388YD | CT-1388VYD | CT-2088YD | CT-2089VYD |
|---|---|---|---|---|
| **Chassis No** | JP358 | KP358 | VP360 | WP360 |
| **Family** | NA7D | NA7D | NA7D | NA7D |
| **Tuning block** | 40k | 40k | 40k | 40k |
| **No of channels** | NO TUNER | 181 | NO TUNER | 181 |
| **Menu language** | English / Spanish | English / Spanish | English / Spanish | English / Spanish |
| **Closed caption** | X | X | X | X |
| **V-Chip** | n/a | X | n/a | X |
| **75 Ω input** | n/a | X | n/a | X |
| **Remote control** | n/a | TV Only | n/a | TV Only |
| **Picture tube supplier** | SAMSUNG | SAMSUNG | AMEC | AMEC |
| **Comb filter** | 2 Dig | 2 Dig | 2 Dig | 2 Dig |
| **V/A norm** | V | V | V | V |
| **Built-in audio power** | 1.5W x 2 (10%) | 1.5W x 2 (10%) | 1.5W x 2 (10%) | 1.5W x 2 (10%) |
| **No. of speakers** | 1 | 1 | 1 | 1 |
| **AI sound** | n/a | n/a | n/a | n/a |
| **Video in rear** | 3 BNC | 3 BNC | 3 BNC | 3 BNC |
| **Audio in rear** | 3 RCA | 3 RCA | 3 RCA | 3 RCA |
| **Video program out** | 3 BNC | 3 BNC | 3 BNC | 3 BNC |
| **Audio program out** | 3 RCA | 3 RCA | 3 RCA | 3 RCA |
| **S-VHS (input/output)** | 1/1 | 1/1 | 1/1 | 1/1 |
| **EPJ/HPJ/MISC** | EPJ | EPJ | n/a | n/a |
| **Dimensions mm (WxDxH) in** | 359.2 x 395 x 337.3<br>14.1 x 15.6 x 13.3 | 359.2 x 395 x 337.3<br>14.1 x 15.6 x 13.3 | 515.7x490.5x461.7<br>20.30x19.31x18.17 | 515.7x490.5x461.7<br>20.30x19.31x18.17 |
| **Weight (kg/lbs)** | 9 / 19.8 | 9 / 19.8 | 19 / 41.8 | 19 / 41.8 |
| **Anode voltage** | 23.75 ± 1.25 kV | 23.75 ± 1.25 kV | 27.70 ± 1.25 kV | 27.70 ± 1.25 kV |
| **A-Board TNP2AH024** | EM | EN | FB | FC |
| **C-Board TNP2AA075** | AE | AE | AD | AD |
| **X-Board TNP2AA098** | NIL | AA | NIL | AA |
| **G-Board TNP2AA019** | NIL | NIL | NIL | NIL |
| **H-Board TNP2AA020** | NIL | NIL | NIL | NIL |

Table 1. **receiver features**

***Note:** When ordering a board, add and " S" after the board suffix application.*
*Example, If order A-Board for* **CT-1388YD***, should be ordered as:* **TNP2AH024EMS***.*

Specifications are subject to change without notice or obligation.
Dimensions and weights are approximate.

# Receiver feature table

| FEATURE\MODEL | CT-2788YD | CT-2789VYD |
|---|---|---|
| **Chassis No** | GP363 | HP363 |
| **Family** | NA7D | NA7D |
| **Tuning block** | 40k | 40k |
| **# of channels** | NO TUNER | 181 |
| **Menu language** | English / Spanish | English / Spanish |
| **Closed caption** | X | X |
| **V-Chip** | n/a | X |
| **75 Ω input** | n/a | X |
| **Remote control** | n/a | TV Only |
| **Picture tube supplier** | AMEC | AMEC |
| **Comb filter** | 2 Dig | 2 Dig |
| **V/A norm** | V | V |
| **Built-in audio power** | 3.5W x 2 (10%) | 3.5W x 2 (10%) |
| **No. of speakers** | 2 | 2 |
| **AI sound** | n/a | X |
| **Video in rear** | 1 BNC | 1 BNC |
| **Audio in rear** | 1 Set stereo RCA | 1 Set stereo RCA |
| **Video program out** | 1 BNC | 1 BNC |
| **Audio program out** | 1 Set stereo RCA | 1 Set stereo RCA |
| **S-VHS (input/output)** | 1/1 | 1/1 |
| **EPJ/HPJ/MISC** | n/a | n/a |
| **Dimensions mm (WxDxH) in** | 731 x 684 x 614<br>28.8 x 26.9 x 24.2 | 731 x 684 x 614<br>28.8 x 26.9 x 24.2 |
| **Weight (kg/lbs)** | 35 / 77.2 | 35 / 77.2 |
| **Anode voltage** | 29.25 ± 1.25 kV | 29.25 ± 1.25 kV |
| **A-Board TNP2AH024** | BL | BM |
| **C-Board TNP2AA075** | AG | AG |
| **X-Board TNP2AA098** | AB | AC |
| **G-Board TNP2AA019** | AD | AC |
| **H-Board TNP2AA020** | NIL | NIL |

Table 1. **receiver features**

***Note:** When ordering a Board, add and " S" after the board suffix application. Example, if order A-Board for* **CT-2788YD**, *should be ordered as:* **TNP2AH024BLS**.

Specifications are subject to change without notice or obligation.
Dimensions and weights are approximate.

# Location of controls (receiver)

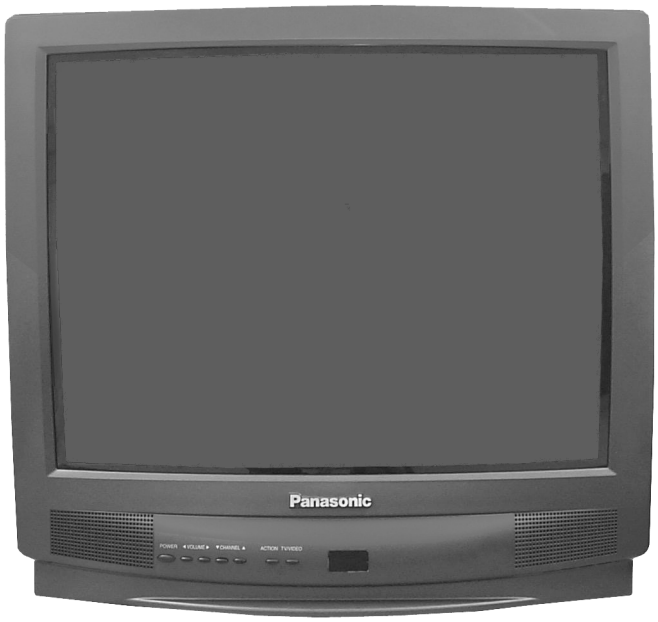
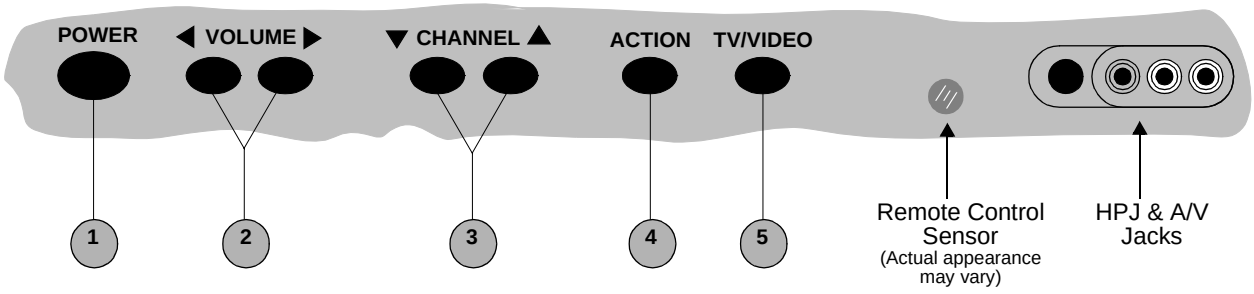



Figure 2. **Location of controls (receiver) -- CT-2789VYDE.**




## Quick reference control operation

| Quick reference control operation | |
|---|---|
| 1 | **POWER button -** Press to turn ON or OFF. |
| 2 | **VOLUME buttons -** Press to adjust sound level, or to adjust audio menus, video menus, and select operating features when menus are displayed |
| 3 | **CHANNEL buttons -** Press to select programmed channels. Press to highlight desired features when menus are displayed. Also use to select cable converter box channels after programming remote control infra-red codes (the TV/AUX/CABLE switch must be set in CABLE position). |
| 4 | **ACTION button -** Press to display main menu and access on screen feature and adjustment menus. |
| 5 | **TV/VIDEO button -** Press to select TV or Video Input. |

# Location of controls (remote) Cont.

(for models with remote control)

| POWER button |
| --- |
| Press to turn ON and OFF. |
| **MUTE button** |
| Press to mute sound. A second press resumes sound. Press also to access and delete closed caption display. |
| **TV/VIDEO button** |
| Press to select TV or Video input. |
| **VOLUME buttons** |
| Press to adjust TV sound level. Use with channel buttons to navigate in menus. |
| **CHANNEL buttons** |
| Press to select channels. Use with volume buttons to navigate in menus. |
| **ACTION button** |
| Press to display main menu and access or exit on screen features and adjustment menus. |
| **Keypad buttons** |
| Press desired channel number to randomly access any channel. |
| **R-TUNE (rapid tune) button.** |
| Press to switch to the previous channel. |
| **RECALL button** |
| Press to display time, status of sleep timer, channel, video mode and channel caption (station identifier). |

**EUR501450**

Figure 3. **Location of controls (remote)**.

# Disassembly for service

## Back cover

Remove all the screws marked with an arrow( ◄ ) from the back of the receiver, see Fig. 7.

***Note:*** *Screw configuration, type, and number of screws vary depending on the model of the receiver serviced and the application; various models are covered in this manual. Use same hardware when reassembling the receiver.*

- 2 screws at the top edge of the receiver.
- 2 screws at the lower corners of the receiver.
- 1 screw by the a/v jacks.
- 1 screw by the fly-back assembly.

## A-Board - main chassis (may vary)

1. Pull carefully the tab in the chassis rail, at the left side of the main chassis, this will release the rail from the cabinet. See Fig 5.
2. Slide the chassis and rail completely out of the guide rails of the cabinet.
3. Stand the receiver on its edge. The underside of the board is completely accessible for component replacement.

***Note:*** *Some tie-wraps that secure the wire dressings may need to be unfastened for chassis removal.*

4. When reassembly, place the chassis rail on the cabinet, then place the main chassis, be sure is in the rails at both sides, then push all the way to the front.

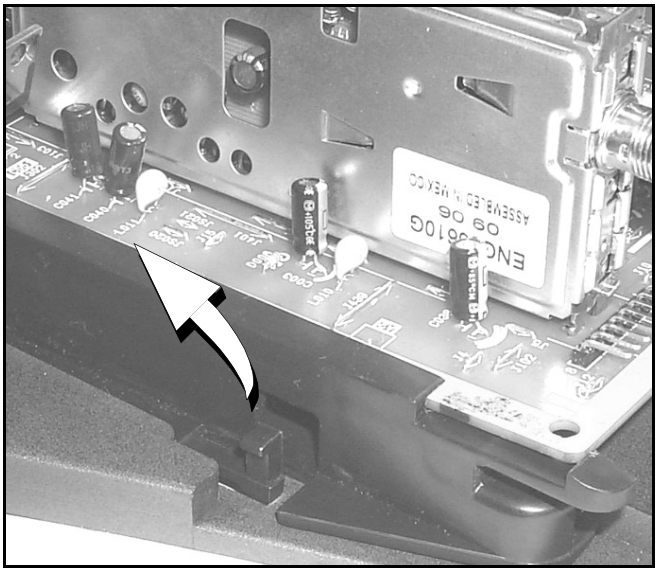


Figure 4. **Chassis rail detail**

## C-Board - CRT output

Plugs into the socket on the CRT neck.
To release the focus wire, use a flat tool to release the tab in the socket, *see Fig. 5* ***A***, pull the wire-look up and remove the wire by pulling away the socket ***B,*** To re-insert, close the wire-look by pushing until is secured with the tab, and insert the wire into the socket

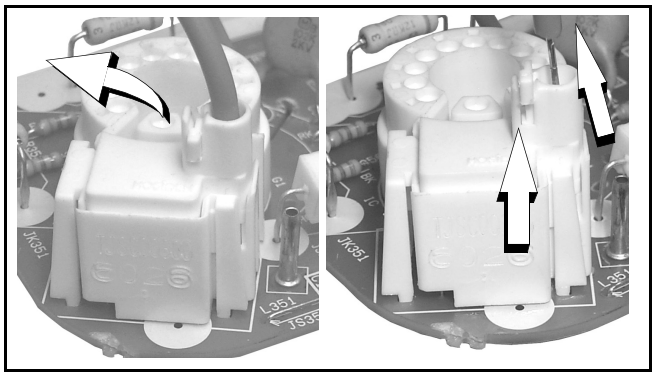


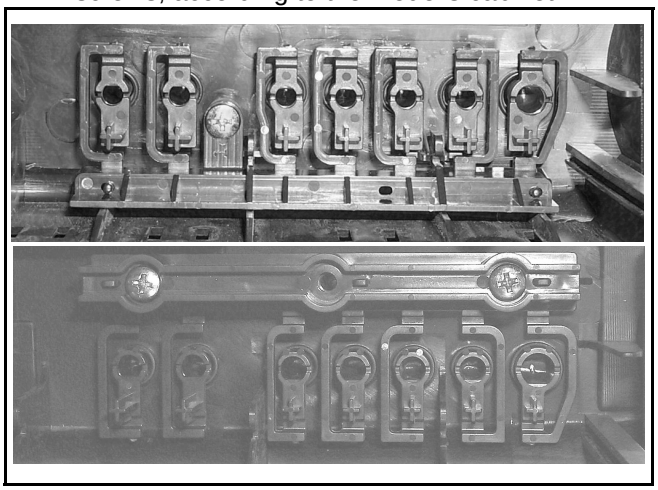
Figure 5. **Focus wire release**

## Speakers

Speakers are secured to the front of the cabinet with 2 screws in diagonal (opposite corners).

## Keyboard push button assembly

Fastened to the inside of the cabinet front with 1 or 2 screws, according to the model's cabinet.



## Disassembly for CRT replacement

1. Discharge the CRT as instructed in the **safety precautions** (see page 2).
2. Disconnect the yoke (DY) plug and degaussing coil (DEG) plug from the main board.
3. Unplug the CRT 2nd anode button.
4. Remove the C-Board from the CRT base and unplug the black wire (CRT dag ground) C10.
5. Disconnect speakers plug SP from the A-Board.
6. Lift the main chassis (A-Board) completely out with the CRT board attached.

## CRT replacement

1. Perform **disassembly for crt replacement** procedure.
2. Insure that the CRT H.V. Anode button is discharged before handling the CRT. Read the **safety precautions** (see page 2) on handling the picture tube.
3. Remove the components from the CRT neck and place the cabinet face down on a soft pad.
4. Note the original order for the CRT mounting hardware.
5. Remove the CRT with the degaussing coil and the dag ground braid attached.
6. Note the original locations and mounting of the degaussing coil and the dag ground assembly to insure proper reinstallation on the replacement CRT.

   **To remove and remount the degaussing coil:** The degaussing coil is held in place by 4 plastic ties fastened to the CRT corner ears. see Fig. 6 to remove Coil cut the plastic ties.

   *- 4 plastic ties are included in the degaussing coil installation kit (refer to parts list for correct part No)*

   To re-mount, place the two smaller plastic ties in the upper corners, holding the Coil, use the two bigger plastic ties to hold the Coil to the lower corners. Confirm the Coil is tense and fasten to the CRT body.

   To remove and remount the dag ground braid:
   a. Unhook the coil spring from the upper right corner of the CRT.
   b. Release the braid loop from the lower left corner of the CRT.

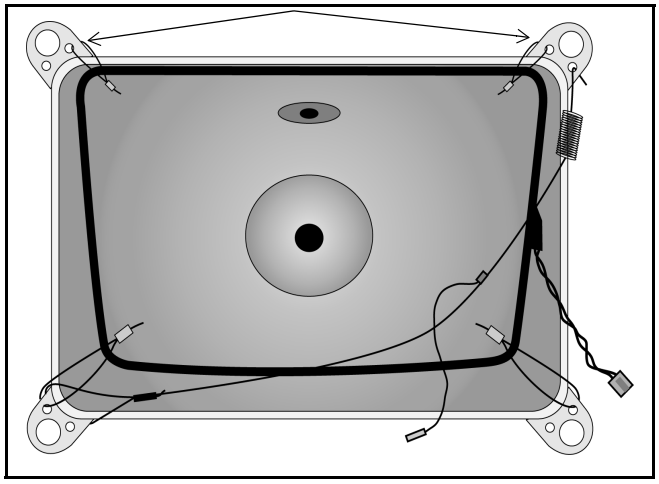


Figure 6. **Deg coil and DAG GND (may vary)**

7. Mount the dag ground braid on the replacement CRT as shown in Fig 7. Position the degaussing coil with new ties. Dress coil as was on the original CRT.
8. Replace the components on CRT neck and reinstall into cabinet. Verify that all ground wires and circuit board plugs get connected.

**IMPORTANT**
**Screw number and configuration, A/V jacks and connectors may vary according to the model.**

# Back cover disassembly

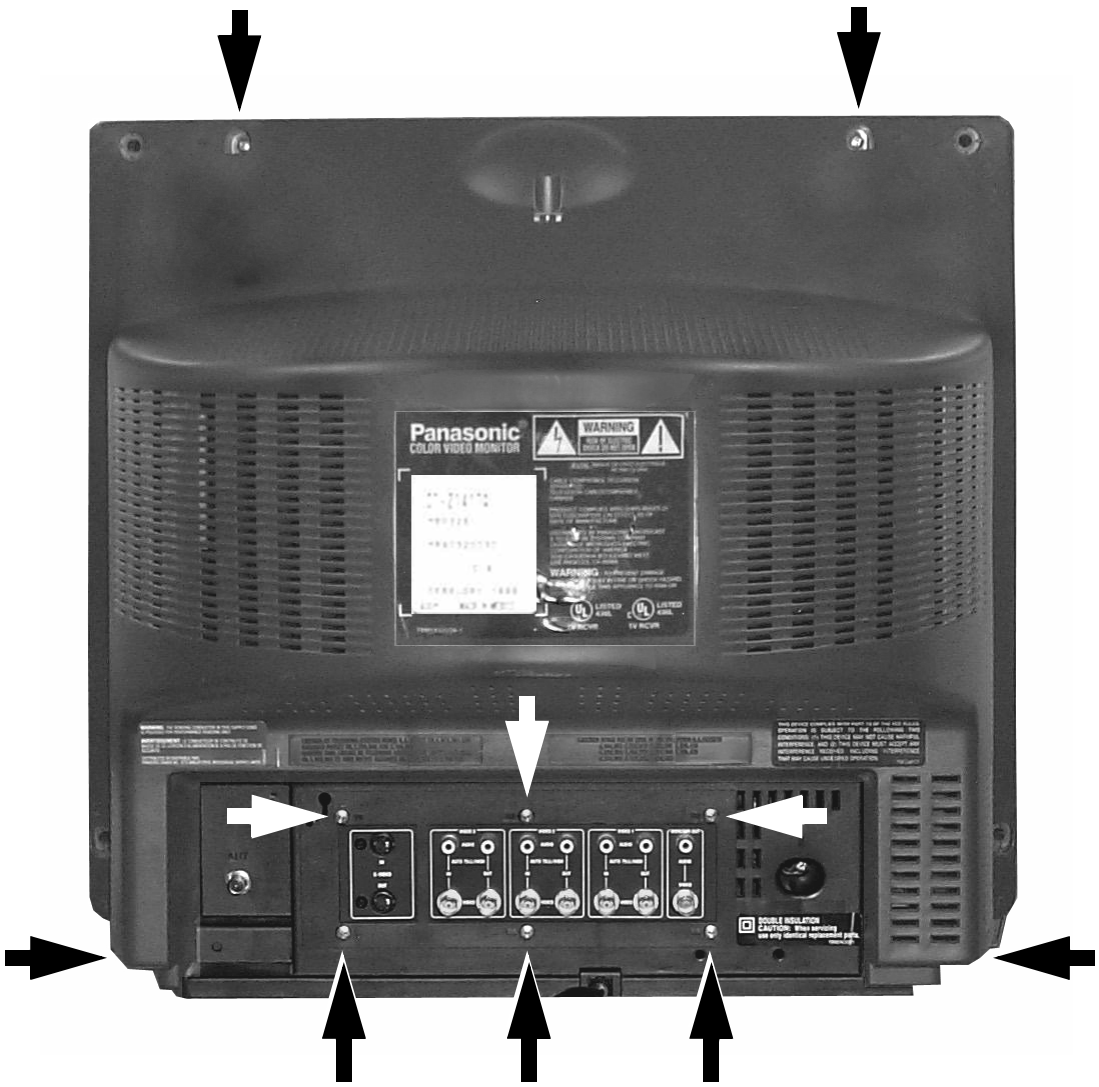



Figure 7. **Back cover removal (20” tuner model)**

- **2 screw at the top edge**
- **1 screw in each lower corner**
- **6 screw by the A/V board**

**IMPORTANT**
**After servicing the receiver, remember to dress the cables a shown above.**

# Main components location

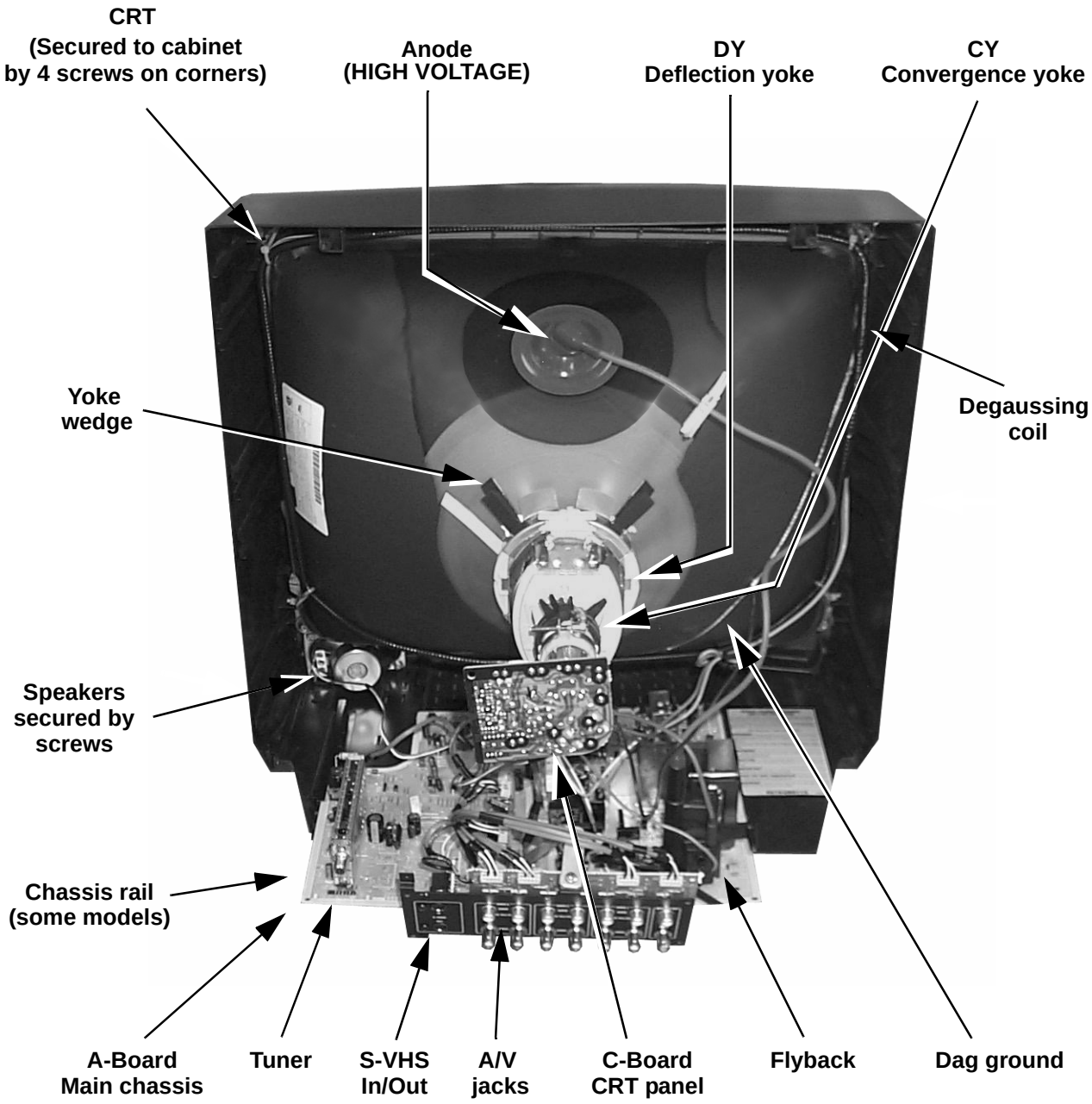



Figure 8. **Rear view**

***Note:*** *Tuner may not be available on some models audio and video inputs may vary according to the model.*

# Main components location

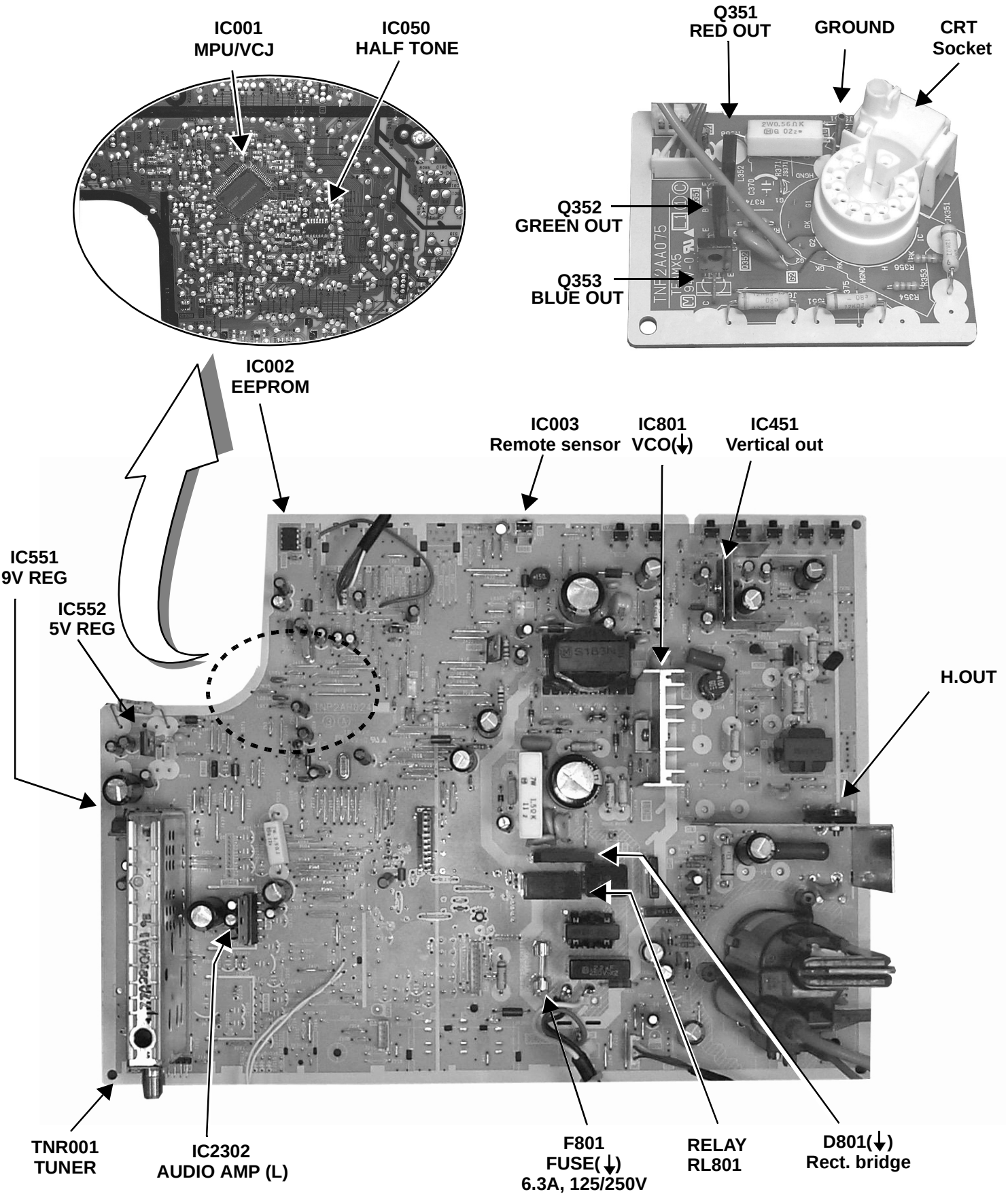


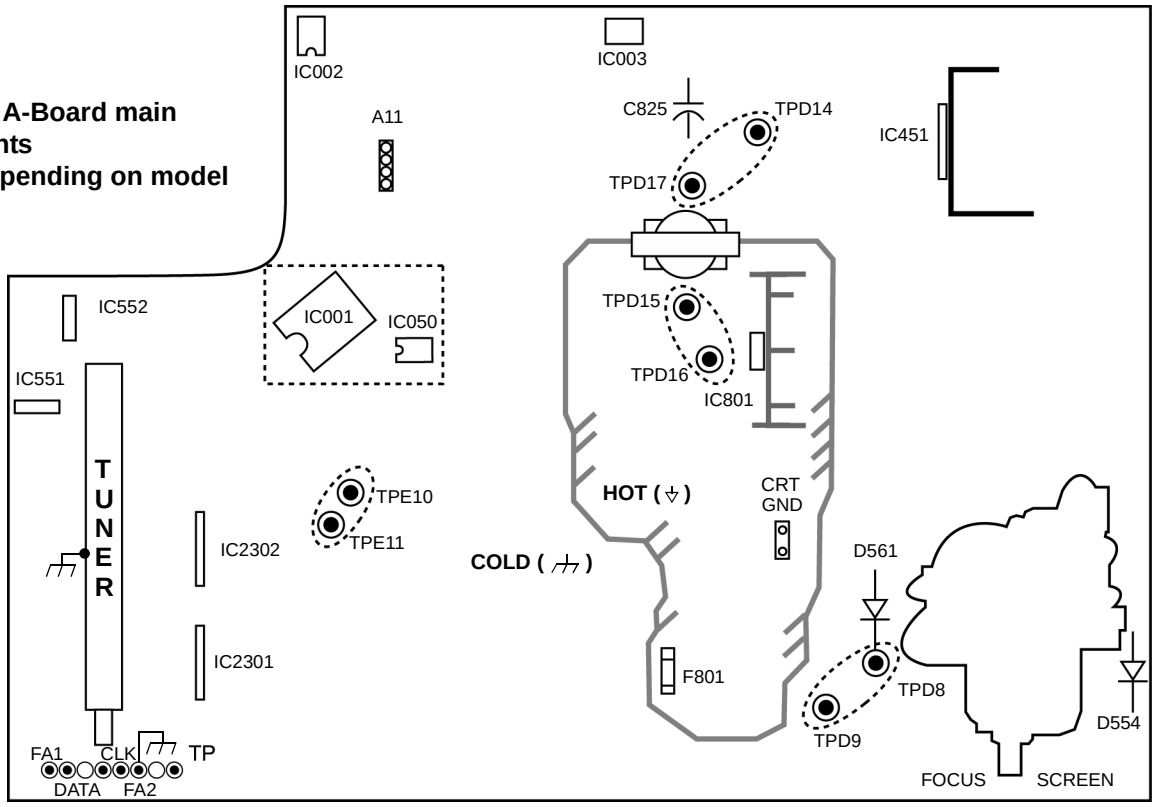

Figure 9. A-Board view (may vary depending on model)

# Chassis service adjustment procedures

**All service adjustments are factory preset and should not require adjustment unless controls and/or associated components are replaced.**

***Note:*** *Connect the (-) lead of the voltmeter to the appropriate ground. Use IC801's heat sink when the HOT ground symbol (⏚) is used. Otherwise, use COLD ground (⏚) — tuner shield, IC451's heat sink or FA2.*

Figure 10. **A-Board main components (varies depending on model**




*COMPONENTS WITHIN DOT LINES ARE LOCATED AT THE OPOSITE SIDE OF BOARD.*

## 130.0V B+ voltage confirmation

1. Set the **bright** and the **picture** to minimum by using the picture menu.
2. Connect the DVM between **C825(+ side)** and cold ground (⏚).
3. Confirm that B+ voltage is **130.0V ± 2.5V**. This voltage supplies B+ to the horizontal output & flyback circuits.

## Source voltage chart

120V AC line input. Set the **bright** and the **picture** to minimum by using the picture menu. Use cold ground (⏚) for the (-) lead of the DVM.

| | VOLTAGE | |
|---|---|---|
| **LOCATION** | **13"** | **20" & 27"** |
| **TPD8** | 23.0V ± 2.0V | 26.0V ± 2.0V |
| **TPD9** | 13.0V ± 2.0V | 13.0V ± 2.0V |
| **IC552** Pin3 | 5.0V ± 0.25V | 5.0V ± 0.25V |
| **IC551** Pin3 | 9.0V ± 0.25V | 9.0V ± 0.25V |
| **D554** Cathode | 180V ± 15V | 200V ± 15V |

Adjust picture menu for normalized video adjustments.

## High voltage check

1. Select an active TV channel and confirm that horizontal is in sync.
2. Adjust brightness and picture using picture icon menu so video just disappears.
3. Confirm B+ 130V is within limit.
4. Using a high voltage meter confirm that the high voltage is:

| | |
|---|---|
| **23.75kV ± 1.25kV** | **13"** |
| **27.70kV ± 1.25kV** | **20"** |
| **29.25kV ± 1.25kV** | **27"** |

# Purity and convergence procedure

Adjustment is necessary only if the CRT or the deflection yoke is replaced or if the setting was disturbed. The complete procedure consists of:

1. Vertical raster shift adjustment. **(Only for models with purity/convergence assembly with 4 pairs of rings)**.
2. Initial static convergence.
3. Setting the purity.
4. Final static convergence.

## When the CRT or the yoke is replaced

Place the yoke on the CRT neck (do not tighten the clamp).

**For a 2-piece assembly (see Fig. 11):**

Position purity/convergence assembly as shown and tighten clamp snugly. Remove the hot-melt glue seal on assembly and position like tabs of purity device together at 12 o'clock to reduce its magnetic field effect.

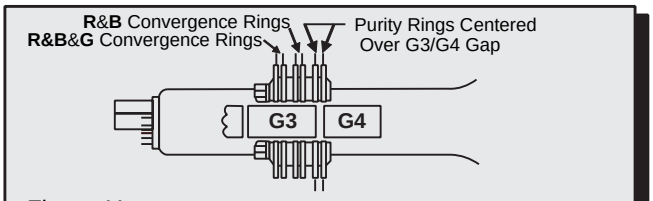



Figure 11. **Positioning of purity/convergence assembly (2-piece assembly)**

*For models using 4 pairs of rings, place the vertical raster shift tabs at 3 o'clock (90º from the purity and convergence tabs, see Fig. 12 and see Fig. 13)*

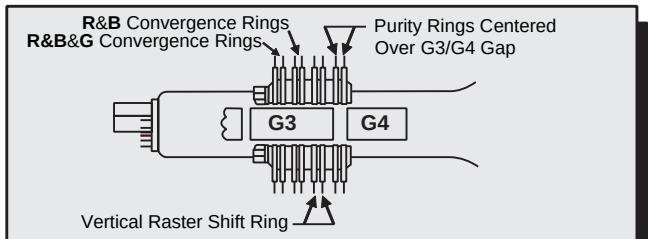



Figure 12. **Positioning of purity/convergence assembly (4 pairs of rings)**

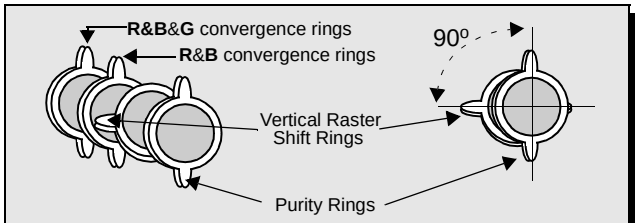



Figure 13. **Positioning of purity/convergence assembly (4 pairs of rings)**

**For a 1-piece assembly (see Fig. 14):**

Position like tabs of purity devices together at 12 o'clock to reduce any magnetic field effect. (For better results, note part number and look for specifications at service center)

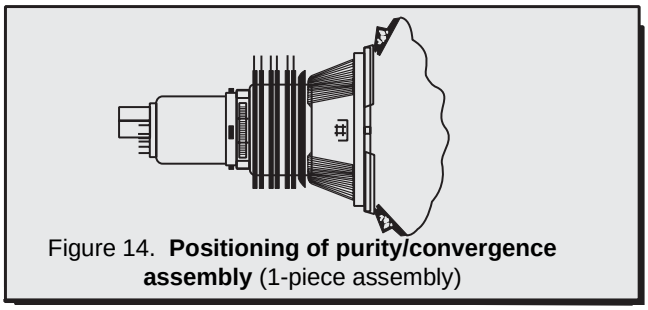


Figure 14. **Positioning of purity/convergence assembly** (1-piece assembly)

**For either assemblies**:

Turn the receiver ON. Operate the receiver for 60 minutes using the first purity check field (white screen) to stabilize the CRT.

Fully degauss the receiver by using an external degaussing coil.

Slide the deflection yoke back and forth on the neck of the CRT until it produces a near white, uniform raster.

## Vertical raster shift adjustment **(only for models with purity/convergence assembly with 4 pairs of rings)**.

Apply a green pattern with a horizontal line, adjust the deflection yoke so that has no tilt, then secure it.

Adjust center line of the pattern with the mechanical center of the CRT, this center is determined by two marks at the side edges of the screen. To adjust the line, once the vertical raster shift tabs are place at 3 o'clock to reduce its magnetic field effect (see Fig. 12 and see Fig. 13) open the tabs the same angle from the center, until the center line of the pattern becomes a straight line, centered with the marks of the CRT. (see Fig. 15)

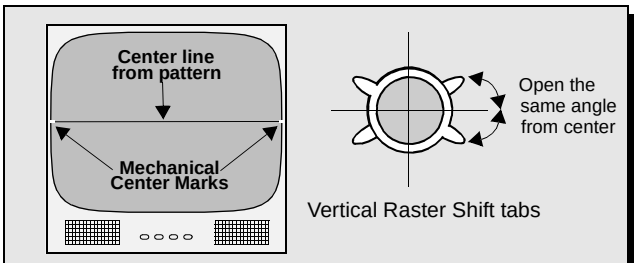



Figure 15. **Vertical Raster Shift Adjustment (4 pairs of rings assembly)**

## Initial center static convergence

Connect a dot/cross hatch generator to the receiver and tune in a signal. Observe misconvergence at center of the screen only.
Adjust the R&B pole magnets; by separating tabs and rotating to converge blue with red.
Adjust the R&B&G pole magnets: by separating tabs and rotating to converge blue and red (magenta) with green.

> ***Note:*** *Precise convergence at this point is not important.*

## Purity adjustment

When the receiver is in the service mode for making electronic adjustments, press the **recall** button on the remote control to enter purity check. (See the **service adjustments electronic controls** procedure).
Operate the receiver for 60 minutes using the first purity check field (white screen) to stabilize the CRT.
Fully degauss the receiver by using an external degaussing coil.
Press the **recall** button on the remote control again until the purity check (green screen) appears.

**For a 2-piece assembly** (see Fig. 11)**:**
Loosen the deflection yoke clamp screw and move the deflection yoke back as close to the purity magnet as possible.
Adjust the purity rings to set the vertical green raster precisely at the center of the screen (see Fig. 16).

NOTES:
1. CRT warm up with white screen (three guns activated) is needed to stabilize the shadow mask expansion.
2. Initial center static convergence (roughly centers three gun beams) is required in order to perform purity adjustment.

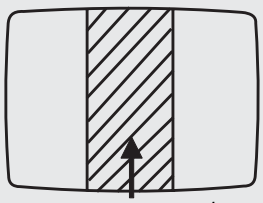



Figure 16. **Green raster adjustment**

Slowly move the deflection yoke forward until the best overall green screen is displayed.

**For a 1-piece assembly** (see Fig. 14)**:**
Slowly move the deflection yoke and purity rings assembly toward the CRT board and adjust the purity magnet rings to set vertical green raster at center of screen (see Fig. 16).
Gradually move the deflection yoke & purity rings forward and adjust for best overall green screen.

**Continue from here for either assemblies:**
Tighten the deflection yoke clamp screw.
Press the **Recall** button on the remote control again until the purity check (blue screen) and (red screen) appear and observe that good purity is obtained on each respective field.
Press the **Recall** button on the remote control again until purity check (white screen) appears. Observe the screen for uniform white. If purity has not been achieved, repeat the above procedure.

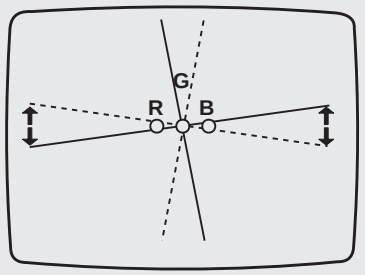
## Final convergence procedure (see Fig. 17 through see Fig. 19):

> ***Note:*** *Vertical size and focus adjustments must be completed prior to performing the convergence adjustment. Connect a dot pattern generator to the receiver. The* ***Brightness*** *level should not be higher than necessary to obtain a clear pattern.*

Converge the red and the blue dots at the center of the screen by rotating the R&B pole static convergence magnets.
Align the converged red/blue dots with the green dots at the center of the screen by rotating the R&B&G pole static convergence magnets. Melt wax with soldering iron to reseal the magnets.
Slightly tilt vertically and horizontally (do not rotate) the deflection yoke to obtain a good overall convergence.
If convergence is not reached at the edges, insert permalloy (see following section) from the DY corners to achieve proper convergence. Re-check for purity and readjust if necessary.
After vertical adjustment of the yoke, insert wedge at 11 o'clock position, then make the horizontal tilt adjustment.
Secure the deflection yoke by inserting two side wedges at 3 and 7 o'clock positions.
Apply adhesive between tab (thin portion) of wedge and CRT and place tape over the tab to secure to the CRT.

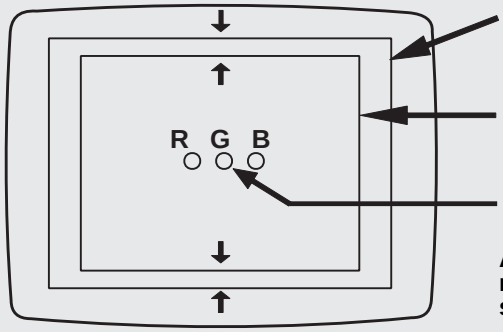
## Permalloy convergence corrector strip (Part No. 0FMK014ZZ)

This strip is used in some sets to match the yoke and CRT for optimum convergence. If the yoke or CRT is replaced, the strip may not be required.
First converge the set without the strip and observe the corners.
If correction is needed:
1. Place strip between CRT and yoke, in quadrant needing correction. Slowly move it around for desired results.
2. Press adhesive tightly to the CRT and secure with tape.




**As the yoke is tilted vertically, the rasters produced by the outside guns rotate in opposite directions.**

Figure 17. **Vertical yoke movement**




Raster produced from one of the outside electron beams

Raster from the other side electron beam

Static convergence magnets are set for center convergence

**As the yoke is tilted horizontally, one raster gets larger while the other gets smaller**

Figure 18. **Horizontal yoke movement**

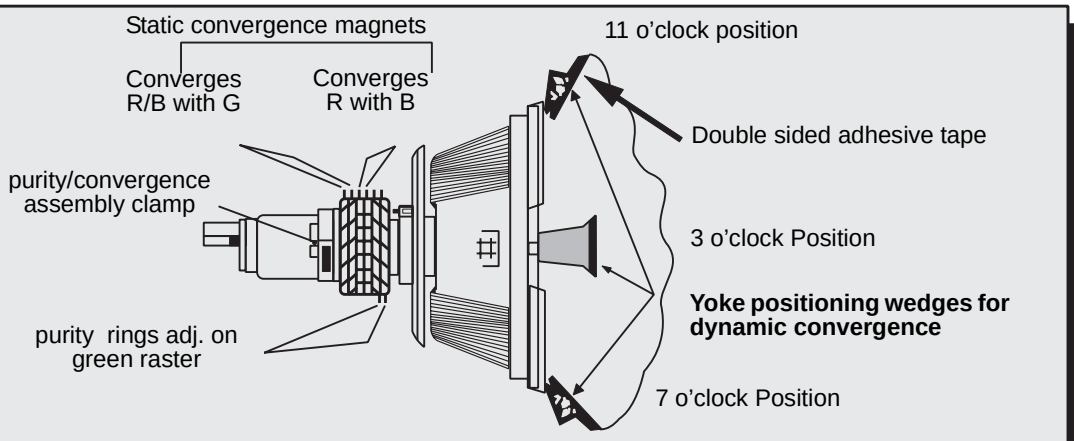



Figure 19. **Convergence magnets and wedges location**

***Note:*** *For models using 4 pairs of rings assemblies see see Fig. 12 for*

# Service mode (electronic controls)

This receiver has electronic technology using the I²C bus concept. It performs as a control function and it replaces many mechanical controls. Instead of adjusting mechanical controls individually, many of the control functions are now performed by using “on screen display Menu”. (The **service adjustment mode**)

***Note:*** *It is suggested that the technician reads all the way through and understand the following procedure for entering/exiting the* ***service adjustment mode****; then proceed with the instructions working with the receiver. When becoming familiar with the procedure, the flow chart for serviceman mode may be used as a quick guide.*

## Quick entry to service mode (models with remote control only, for models without remote see page 24 method):

At times when minor adjustments need to be done to the electronic controls, the method of entering the service mode without removal of the cabinet back is as follows using the remote control:

1. Select SET-UP icon and select CABLE mode.
2. Select TIMER icon and set SLEEP time for 30 min.
3. Press ACTION button twice to exit menus.
4. Tune to the Channel 124.
5. Adjust VOLUME to minimum (0).
6. Press the VOL ◀ button (decrease) **on receiver**. Red “CHK” appears in upper corner.

### To toggle between aging and service modes:

While the “CHK” is displayed on the left top corner of the CRT, pressing the ACTION and the volume Up buttons on the receiver simultaneously will toggle between the modes. Red “CHK” for service and yellow “CHK” for aging (aging mode is used in the factory for quick operation).

7. **Press** the **power** button on the **remote control** to select one of service adjustment modes.
   1) **B**= Service VCJ SUB-DATA adjustments.
   2) **C**= Service VCJ CUT-OFF adjustments.
   3) **S**= Service OPTIONS (PICTURE) adjustments.
   4) **M**= Service MTS adjustments.
   5) **P**= Service VCJ adjustments.
   6) **X**= Service AFC adjustments
   7) “**CHK**” = Normal operation of CHANNEL ▲▼ and VOLUME ◀ ▶.

***Note:*** *Only the applicable settings for the receiver serviced will be available (see* **a** *in see Fig. 20).*

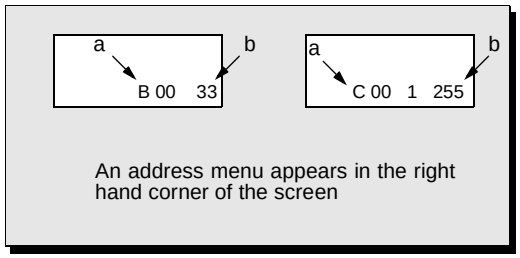



Figure 20. **Service mode menu adjustments.**

## Exiting the service mode:

Press the **Action** and the **Power** buttons on the **Receiver** simultaneously for at least 2 seconds.

**THE RECEIVER EXITS SERVICE MODE.**

The receiver momentarily shuts off; then comes back on tuned to channel 3 with a preset level of sound. Any programmed channels, channels caption data and some others user defined settings will be erased.

**IMPORTANT NOTE:**
Always exit the service mode following adjustments.

## IMPORTANT

Registers marked as **FIXED** in the following tables, are **factory preset**, service personnel **should not change** the default value.

**Press** the **power button** on the **remote control** to select the service adjustment.

### For adjustments:

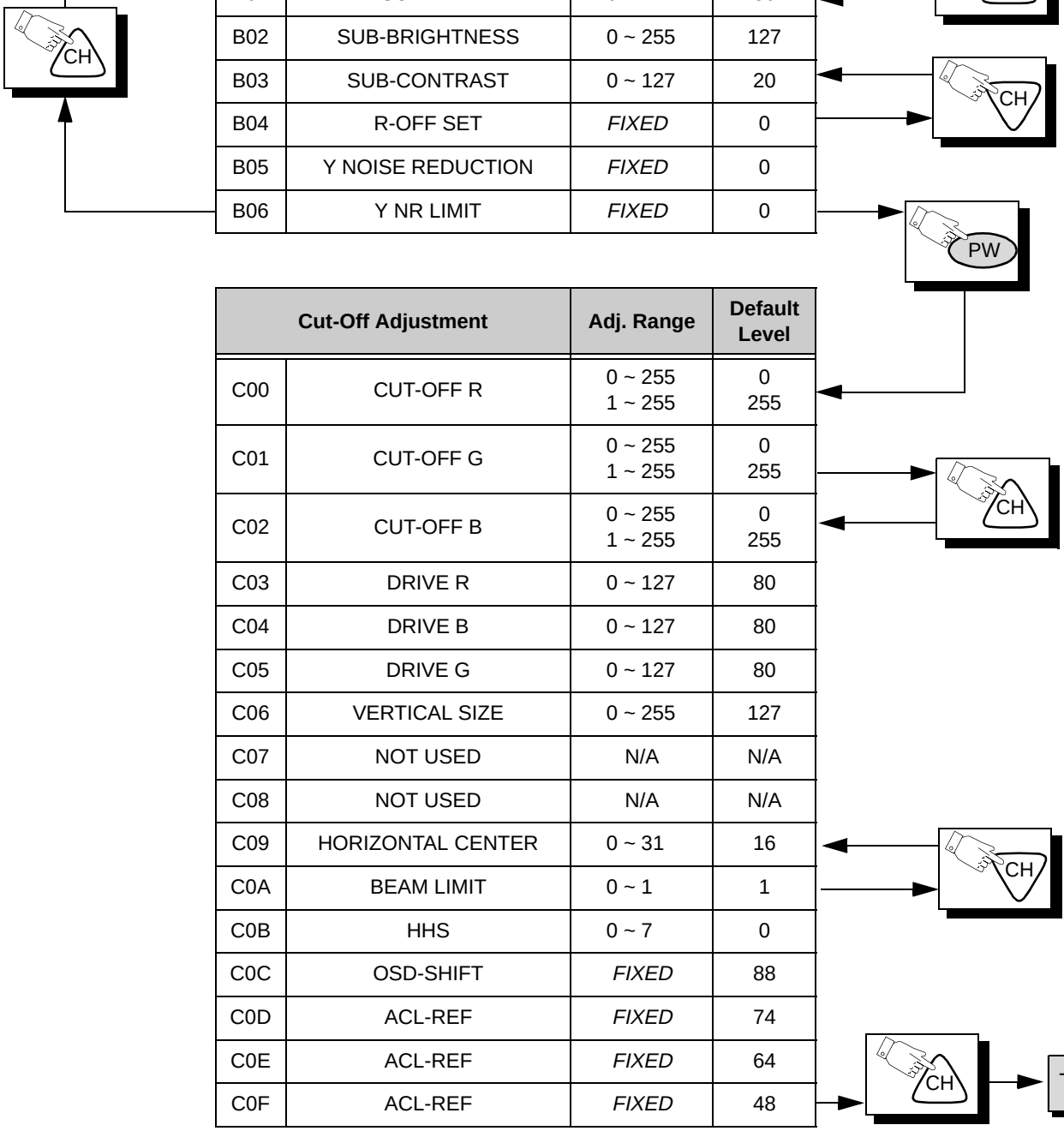
1. **Press channel Up/Down** on the **remote control** to select one of the available service adjustments (**a** in see Fig. 20).

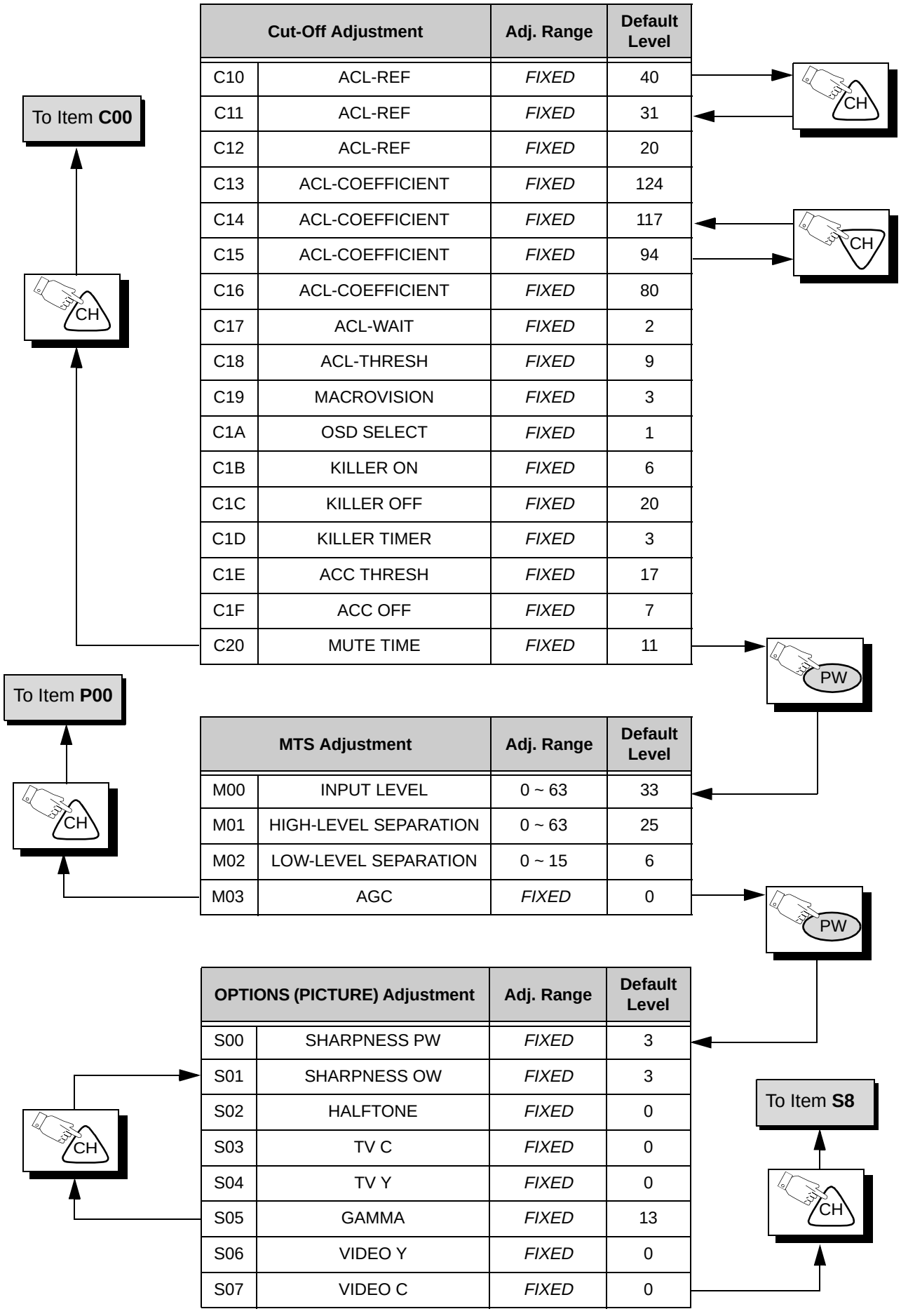
***Note:*** *Write down the original value set (**b** in* see Fig. 20*) for each address before modifying anything. It is easy to erroneously adjust the wrong item.*

2. **Press volume Up/Down** on the **remote control** to adjust the level of the selected service adjustment (**b** in see Fig. 20).

| Sub-Data Adjustment | | Adj. Range | Default Level |
|---|---|---|---|
| B00 | SUB-COLOR | 0 ~ 127 | 33 |
| B01 | SUB-TINT | 0 ~ 127 | 36 |
| B02 | SUB-BRIGHTNESS | 0 ~ 255 | 127 |
| B03 | SUB-CONTRAST | 0 ~ 127 | 20 |
| B04 | R-OFF SET | *FIXED* | 0 |
| B05 | Y NOISE REDUCTION | *FIXED* | 0 |
| B06 | Y NR LIMIT | *FIXED* | 0 |

| Cut-Off Adjustment | | Adj. Range | Default Level |
|---|---|---|---|
| C00 | CUT-OFF R | 0 ~ 255<br>1 ~ 255 | 0<br>255 |
| C01 | CUT-OFF G | 0 ~ 255<br>1 ~ 255 | 0<br>255 |
| C02 | CUT-OFF B | 0 ~ 255<br>1 ~ 255 | 0<br>255 |
| C03 | DRIVE R | 0 ~ 127 | 80 |
| C04 | DRIVE B | 0 ~ 127 | 80 |
| C05 | DRIVE G | 0 ~ 127 | 80 |
| C06 | VERTICAL SIZE | 0 ~ 255 | 127 |
| C07 | NOT USED | N/A | N/A |
| C08 | NOT USED | N/A | N/A |
| C09 | HORIZONTAL CENTER | 0 ~ 31 | 16 |
| C0A | BEAM LIMIT | 0 ~ 1 | 1 |
| C0B | HHS | 0 ~ 7 | 0 |
| C0C | OSD-SHIFT | *FIXED* | 88 |
| C0D | ACL-REF | *FIXED* | 74 |
| C0E | ACL-REF | *FIXED* | 64 |
| C0F | ACL-REF | *FIXED* | 48 |





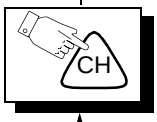

| Cut-Off Adjustment | | Adj. Range | Default Level |
|---|---|---|---|
| C10 | ACL-REF | *FIXED* | 40 |
| C11 | ACL-REF | *FIXED* | 31 |
| C12 | ACL-REF | *FIXED* | 20 |
| C13 | ACL-COEFFICIENT | *FIXED* | 124 |
| C14 | ACL-COEFFICIENT | *FIXED* | 117 |
| C15 | ACL-COEFFICIENT | *FIXED* | 94 |
| C16 | ACL-COEFFICIENT | *FIXED* | 80 |
| C17 | ACL-WAIT | *FIXED* | 2 |
| C18 | ACL-THRESH | *FIXED* | 9 |
| C19 | MACROVISION | *FIXED* | 3 |
| C1A | OSD SELECT | *FIXED* | 1 |
| C1B | KILLER ON | *FIXED* | 6 |
| C1C | KILLER OFF | *FIXED* | 20 |
| C1D | KILLER TIMER | *FIXED* | 3 |
| C1E | ACC THRESH | *FIXED* | 17 |
| C1F | ACC OFF | *FIXED* | 7 |
| C20 | MUTE TIME | *FIXED* | 11 |

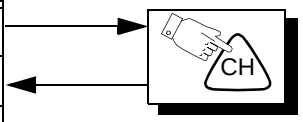
| MTS Adjustment | | Adj. Range | Default Level |
|---|---|---|---|
| M00 | INPUT LEVEL | 0 ~ 63 | 33 |
| M01 | HIGH-LEVEL SEPARATION | 0 ~ 63 | 25 |
| M02 | LOW-LEVEL SEPARATION | 0 ~ 15 | 6 |
| M03 | AGC | *FIXED* | 0 |

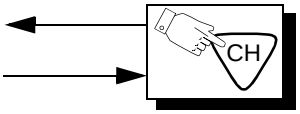
| OPTIONS (PICTURE) Adjustment | | Adj. Range | Default Level |
|---|---|---|---|
| S00 | SHARPNESS PW | *FIXED* | 3 |
| S01 | SHARPNESS OW | *FIXED* | 3 |
| S02 | HALFTONE | *FIXED* | 0 |
| S03 | TV C | *FIXED* | 0 |
| S04 | TV Y | *FIXED* | 0 |
| S05 | GAMMA | *FIXED* | 13 |
| S06 | VIDEO Y | *FIXED* | 0 |
| S07 | VIDEO C | *FIXED* | 0 |

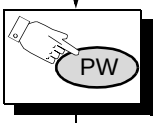
| OPTIONS (PICTURE) Adjustment | | Adj. Range | Default Level |
|---|---|---|---|
| S08 | COMB BPF | *FIXED* | 0 |
| S09 | COMB 2D | *FIXED* | 1 |
| S0A | COLOR KILLER LEVEL | *FIXED* | 0 |
| S0B | PLL KILLER TRESH | *FIXED* | 0 |
| S0C | ACC SW | *FIXED* | 0 |
| S0D | ACC AMP OFF 1 | *FIXED* | 100 |
| S0E | ACC AMP OFF 2 | *FIXED* | 0 |
| S0F | ACC AMP ON | *FIXED* | 20 |
| S10 | ACC AMP CTL | *FIXED* | 3 |
| S11 | BGP POSITION (C) | *FIXED* | 21 |
| S12 | OSD R | *FIXED* | 30 |
| S13 | OSD G | *FIXED* | 30 |
| S14 | OSD B | *FIXED* | 30 |
| S15 | NOISE KILLER TIME | *FIXED* | 5 |
| S16 | NOISE KILLER | *FIXED* | 50 |
| S17 | HV TIMING | *FIXED* | 2 |

To Item **S00**

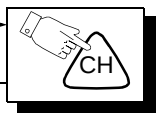


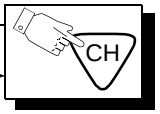



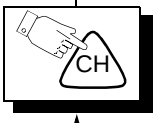




| VCJ Adjustment | | Adj. Range | Default Level |
|---|---|---|---|
| P00 | FORCE BS | *FIXED* | 1 |
| P01 | DET ON/OFF | *FIXED* | 1 |
| P02 | ROM SEL | *FIXED* | 3 |
| P03 | ROM CURVE | *FIXED* | 2 |
| P04 | BS ON/OFF | *FIXED* | 1 |
| P05 | BS TIME CONST | *FIXED* | 5 |
| P06 | TH V | *FIXED* | 4 |
| P07 | TH F1 | *FIXED* | 129 |
| P08 | TH F1 | *FIXED* | 1 |
| P09 | TH OFF1 | *FIXED* | 35 |
| P0A | TH F2 | *FIXED* | 99 |
| P0B | TH F2 | *FIXED* | 1 |
| P0C | TH OFF2 | *FIXED* | 30 |
| P0D | TH F3 | *FIXED* | 80 |
| P0E | TH F3 | *FIXED* | 1 |
| P0F | TH OFF3 | *FIXED* | 21 |

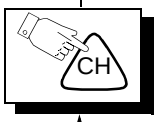


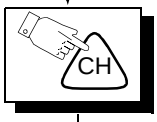

To Item **P10**



To Item **P00**




| VCJ Adjustment | | Adj. Range | Default Level |
|---|---|---|---|
| P10 | TH ON1 | *FIXED* | 37 |
| P11 | TH ON2 | *FIXED* | 33 |
| P12 | TH ON3 | *FIXED* | 25 |
| P13 | CURVE1 | *FIXED* | 3 |
| P14 | CURVE2 | *FIXED* | 3 |
| P15 | CURVE3 | *FIXED* | 3 |
| P16 | RATIO1 | *FIXED* | 0 |
| P17 | RATIO2 | *FIXED* | 2 |
| P18 | RATIO3 | *FIXED* | 3 |




To **B** Items

IMPORTANT NOTE:
Always exit the service mode following adjustments.

***Note:*** *Some adjustments modes may not be available in some models depending on available options.*

## Check purity:

In service mode (red “CHK” is displayed), place a jumper in AG connector, press the **recall** button on the **remote control** to enter to the white purity field check, remove the jumper, press **recall** again to get to red, green and blue purity fields (if jumper is not removed for color fields, they will be displayed with higher luminosity),

In aging mode (*factory mode*, yellow “chk” is displayed), connect a jumper in ag connector, press the **recall** button on the **remote control** to enter the purity field check mode.

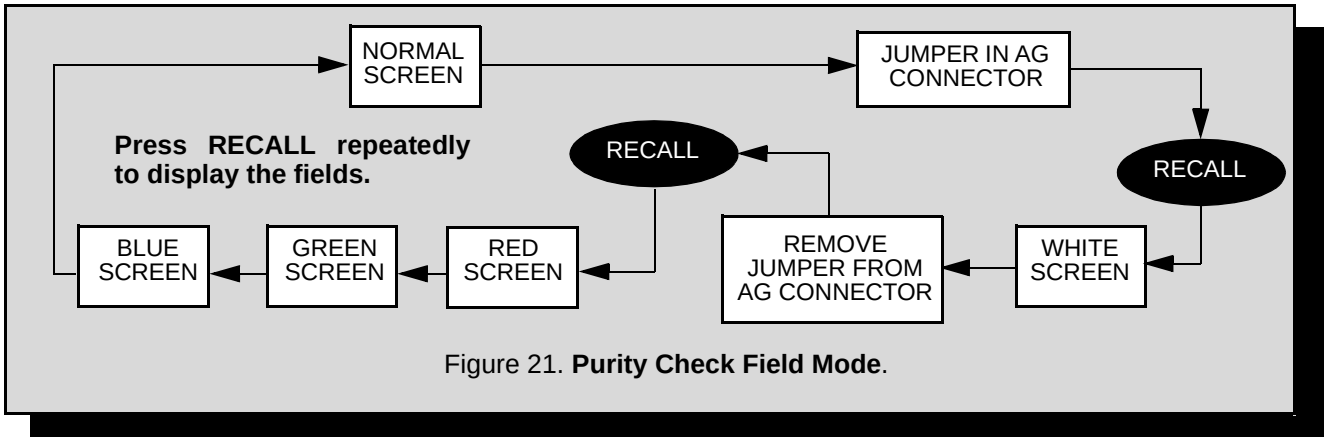



Figure 21. **Purity Check Field Mode**.

### Helpful Hints

### Entering service mode (back-open method, all models)

1. While the receiver is ON and operating in normal mode, momentarily short test point **FA1** (TP8) to Cold Ground ( ⏚ ) **FA2** (TP3) A-Board.
   ***The receiver enters the aging mode***.
   Yellow letters “CHK” appear in the upper left corner of the CRT.
   (The volume Up/Down will adjust rapidly).
2. Simultaneously press the **action** and the **volume up** buttons on the **receiver** control panel.
   ***The receiver enters the service mode.***
   The letter in “CHK” turn red.
   (The volume Up/Down will adjust normally).
   (All costumer controls are set to nominal level).

IMPORTANT NOTE:
Always exit the service mode following adjustments.

## Instructional flow chart for service mode

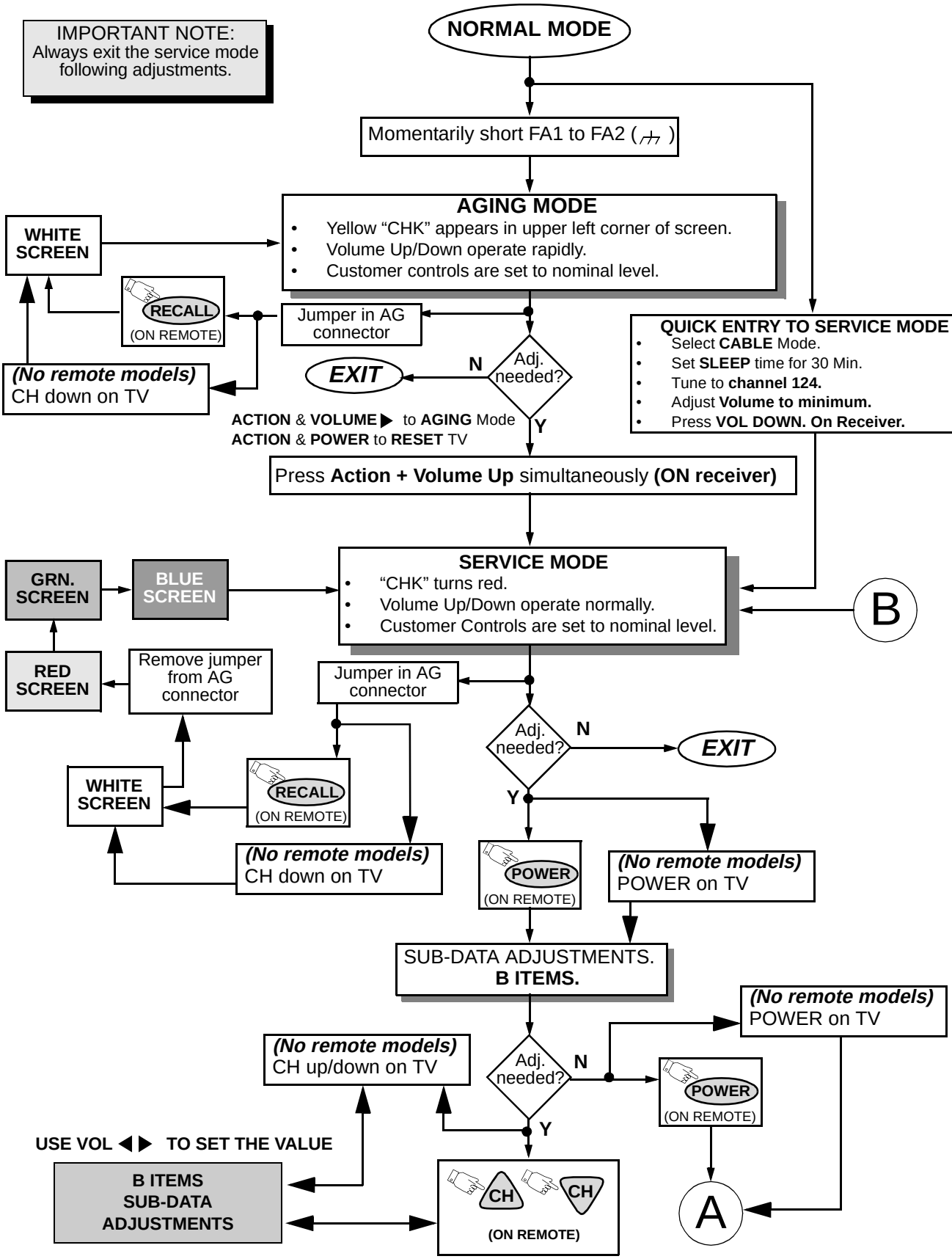



Figure 22.**Flow chart for serviceman mode**.

## Instructional flow chart for serviceman mode - *(continued)*

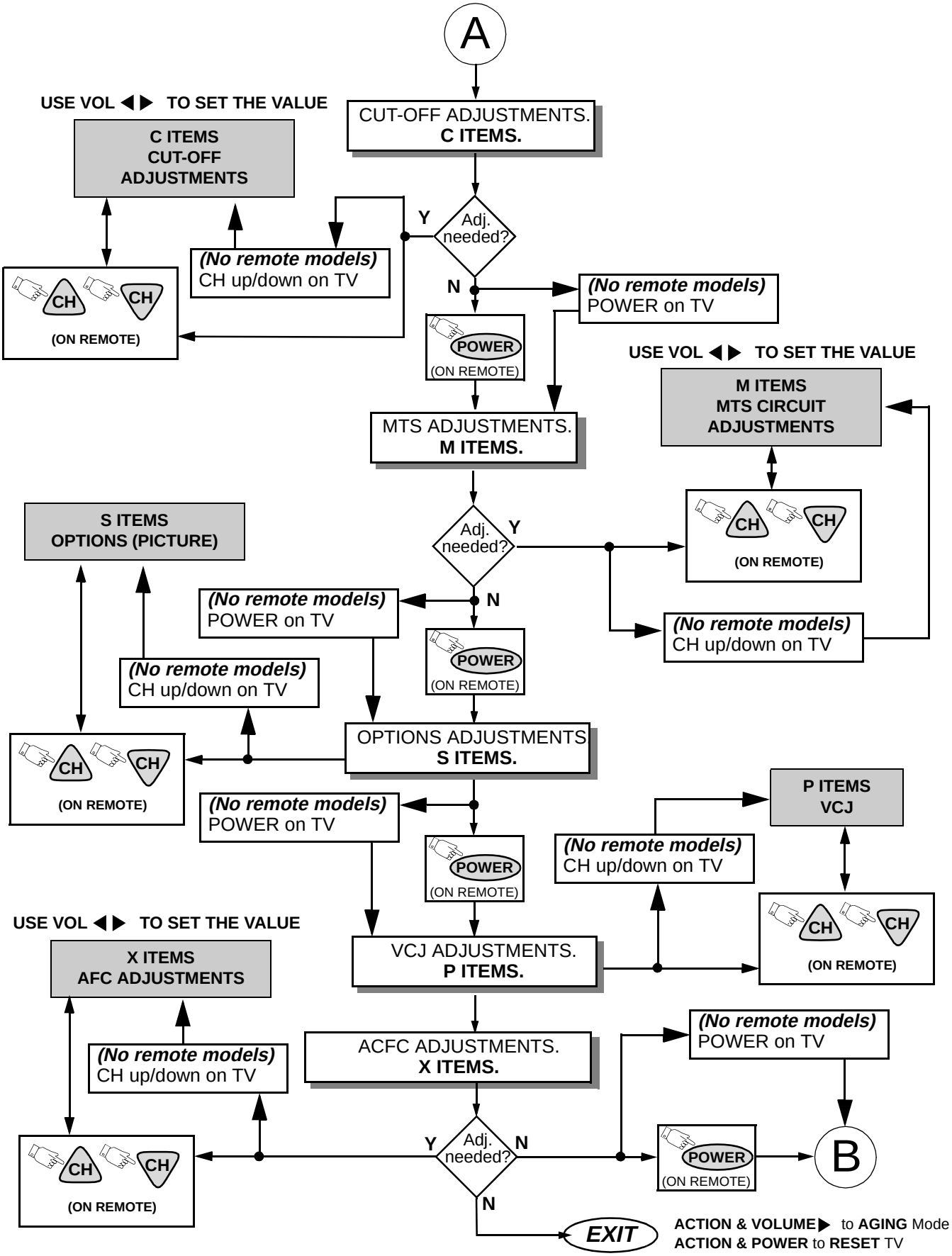



Figure 23. **Flow chart for serviceman mode - *(Continued)***

# Service adjustments (electronic controls)

***Note:*** *It is recommended to allow a 30 min. warm up at highest bright (using white screen) before perform any picture adjustment.*

## Sub-Contrast

**Service DAC (B03)**

This adjustment is factory set. **Do not adjust** unless repairs are made to associated circuit, the CRT board or when the CRT is replaced.

**Preparation:**

1. Apply a color bar signal pattern with 87.5% modulation, 70% saturated color bar with a 100 IRE white and 7.5 black.

   ***Note:*** *The pattern used in this procedure is an EIA color bar pattern with 87.5% modulation with 100 IRE white and 7.5 black. Correlate the information in this procedure to the pattern used if another signal is used.*

2. Preset the following controls:
   - Brightness . . . . . .Center.
   - Picture . . . . . .Max.
   - Sharpness . . . . . .Center.
   - Gamma, *S05* . . . . . .15
   - ACL OFF *C0A* . . . . .00
   - Cut Off G *C01* . . . . .00
3. Connect the scope probe between TP35 (C-Board) and cold ground (⏚).

**Procedure:**

1. In the service mode, select DAC Sub-Contrast adjustment (B03) and adjust to obtain **2.3Vp-p ±0.1V** for **13" models** and **2.5Vp-p ±0.1V** for **20"** and **27" models** from white level to black level on video waveform (see video waveforms detail, see Fig. 23).

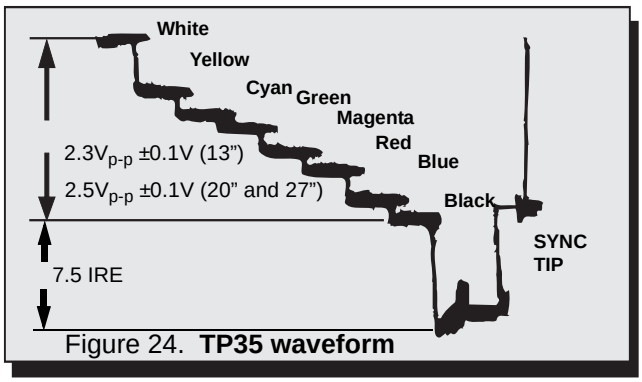



Figure 24. **TP35 waveform**

2. Following adjustments, set service registers to original values (preparation step 2).
3. Turn the set off and remove all connections from chassis.

## Sub-Brightness

**Service DAC (B02)**

Due to the characteristics of this chassis, Sub-Brightness adjustment is no required. To obtain a good brightness level in the picture, set the service register to the default level: 127.

Perform "final Sub-brightness adjustment" only if prefer different level of brightness in the picture.

## Tint/Color adjustment

**Service DACs (B01) (B00)**

**Preparation:**

1. Apply a rainbow color bar signal.
2. Preset the following controls:
   - Brightness . . . . . .Min.
   - Color . . . . . .Center.
   - Tint. . . . . .Center.
   - Picture . . . . . .Max.
   - Sharpness . . . . . .Min.
   - Gamma S05 . . . . . .15
   - ACL OFF C0A . . . . .00
3. Connect the oscilloscope probe between TP37 (C-Board) and cold GND (⏚).

**Procedure:**

1. In the service mode, select DAC B01, Sub-Tint adjustment. Adjust until the waveform measured is as below (see Fig. 24).

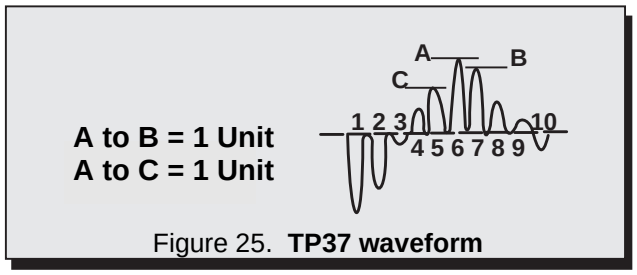



Figure 25. **TP37 waveform**

2. Connect the oscilloscope to TP35 (C-Board).
3. Select DAC sub-color adjustment (B00) and adjust for peak to peak amplitude to be **0.7Vp-p ±0.05V for 13"** and **0.8Vp-p ±0.05V for 20" and 27"** as shown in see Fig. 25.

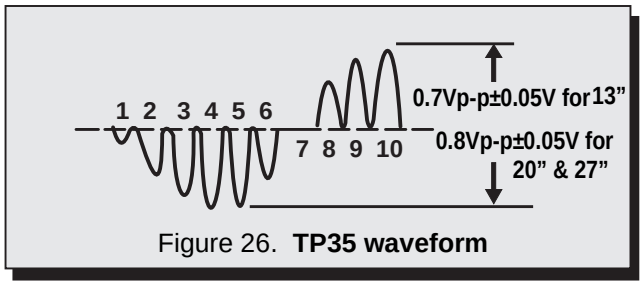



Figure 26. **TP35 waveform**

4. Following adjustments, set service registers to original values (preparation step 2).
5. Turn off the set and remove all connections from chassis.

# Service adjustments (electronic controls, continued)

## White balance

**Service DACs (C00) (C01) (C02) (C03) (C04) (C05)**

**Preparation:**

1. Turn the receiver "ON" and allow 30 minutes warm up at high brightness (White screen).
2. Preset the following service DACs:
   - C00. . . . . 0 255
   - C01. . . . . 0 255
   - C02. . . . . 0 255
   - C03. . . . . 80
   - C04. . . . . 80
   - C05. . . . . 80
3. Confirm with black-white pattern and a white screen the actual balance (gray scale and white level). If white balance is required perform the procedure steps as follow.

**Procedure:**

**CUT-OFF adjustment (low lights)**

1. Apply a black-white pattern.
2. Connect a jumper from Q452-Base to cold ground (⏚). (*Or apply +2.5 V D.C. to TP1 and cold ground (⏚)*) to dis-habilitate the neck protector circuit.
3. Set red Cut-Off (C00) and blue Cut-Off (C02) registers to 00.
4. Press R-Tune in the remote control (to close the vertical circuit and get green horizontal line), for models with no remote press ACTION on TV when DAC is displayed on screen.
5. Connect scope probe between GK (C-Board) and cold ground (⏚).
6. Measure waveform and adjust register G-Cut Off, C01, for the scanning period to be 195V for 27", 175V for 20" and 140V for 13", (see Fig. 26)

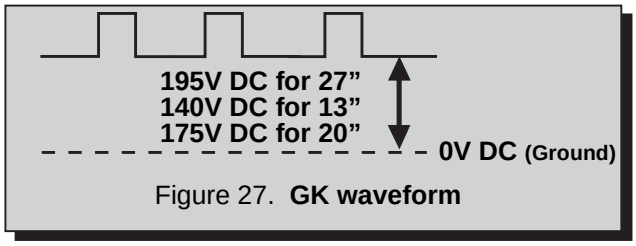



Figure 27. **GK waveform**

7. Adjust screen VR (at T551, Flyback) until the green line just becomes visible.
8. Press R-Tune in remote to open vertical, for models with no remote press ACTION on TV when DAC is displayed on screen.
9. Select red Cut-Off (C00) register, press R-Tune to see green horizontal line. Increase C00 (volume ▶) until the line just become yellow (by mixing green and red).
10. Press R-tune to open the vertical, for models with no remote press ACTION on TV when DAC is displayed on screen.
11. Select blue Cut-Off (C02) register, press R-Tune to close the vertical and see the yellow line, for models with no remote press ACTION on TV when DAC is displayed on screen. Increase C02 (volume ▶) until line just becomes white (mixing green, red and blue).
12. Press R-Tune to open the vertical, for models with no remote press ACTION on TV when DAC is displayed on screen.
13. Confirm that a good gray scale is established by viewing Black-White pattern.

**White balance (high lights)**

1. Using a black-white pattern and white screen, adjust red drive (C03) and blue drive (C05) to obtain correct white level on the screen.
   Observe high light areas, if white turns reddish, decrease red drive register, on the other hand, if white turns bluish, decrease blue drive register.
2. Exit service mode.
3. In "picture" menu, adjust "picture" and "bright" menu adjustments from low scale to high scale and check the black and white tracking.
4. If correction is needed repeat step 1 until obtain a correct balance.
5. After high lights adjustment is satisfactory, perform touch-up procedure as follow.

**White balance touch-up procedure**

(This procedure can be used as a minor adjustment procedure if required)

1. Enter service mode
2. Apply a black and white image signal (recommended with gray tones also).
3. Observe low and high brightness areas for proper tracking.
   - HIGHT LIGHT areas - Adjust red drive register (C03) and Blue drive register (C05) for warm whites.
   - LOW LIGHT areas - Adjust red cut-off register and blue cut-off register for proper black-gray

*Since low level adjustment has a minor effect on high light adjustment levels than vice versa, is recommend perform this adjustment at the end.*

4. Exit service mode turn off the set. Remove all connections from chassis.

# Service adjustments (electronic controls, continued)

## Sub-Brightness final adjustment

**Service DAC (B03)**

Perform this adjustment at the end. After all picture adjustments.

**Preparation:**

1. Turn the receiver ON and allow 20 min. warm up at high brightness (white screen).
2. Apply a black-white cross pattern
3. Preset the following controls for best results:
   - Picture . . . . . Max
   - Bright . . . . . Center

**Procedure:**

1. In service mode, select sub bright register B02
2. Adjust register until get the 7.5 IRE section looks the same light output than 3 Ire section, (see Fig. 27)

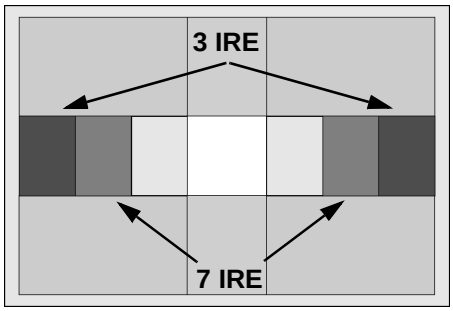



Figure 28. **Sub-bright adjustment**

3. Exit Service Mode.

## Horizontal centering Service DAC (C09)

**Preparation:**

Connect a monoscope pattern.

**Procedure:**

1. In the service mode select the horizontal centering adjustment DAC (C09) and adjust until the center of the pattern is centered on CRT. Distance A should be same than B

A=B

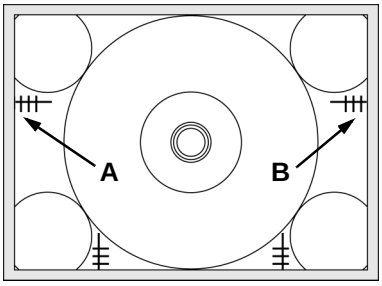



Figure 29. **Horizontal centering**

2. Exit service mode.

## Vertical size

**Service DAC (C06)**

**Preparation:**

Connect a monoscope pattern.

**Procedure:**

1. In the service mode select vertical size adjustment DAC (C06) and adjust until obtain a perfect round picture.(Upper and lower section of the pattern may go out of the visible are)

A≃B

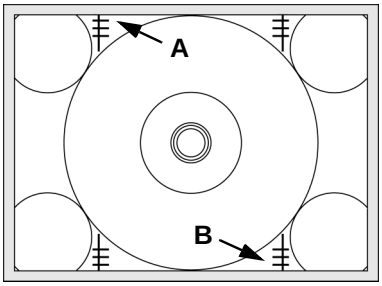



Figure 30. **Vertical size**

2. Exit the service mode.

## MTS circuit adjustments (stereo models only)

The MTS Circuit adjustments require two steps:

1. Input level adjustment.
2. Stereo separation adjustment.

## Input level adjustment (M00) (stereo models only)

**Preparation:**

1. Connect an RMS meter with filter jig as shown, (see Fig. 30).

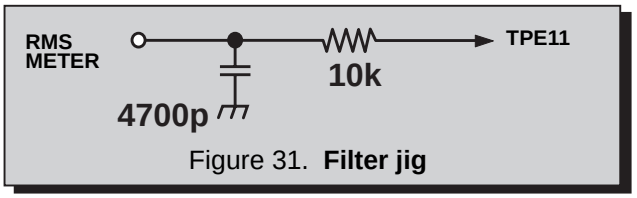



Figure 31. **Filter jig**

2. Connect an RF signal generator to the RF antenna input.

**Procedure**:

1. Apply the following signal from the RF signal generator:
   Video: 100 IRE flat field, 30% modulation.
   Audio: 300Hz, 100% modulation, monaural (70 ±5dB, 75Ω OPEN, P/S 10dB).
2. Adjust the MTS Input level adjustment (M00) until the voltage measured is 106 ± 6.0mV rms.

# Service adjustments (electronic controls, continued)

## Stereo separation adjustment (M01 & M02) (stereo models only)

**Preparation:**

1. Connect an RF signal generator to the RF antenna input.
2. Connect a scope between to TPE10 and cold ground (⏚).

**Procedure:**

1. Select stereo mode in audio menu
2. Apply the following signal from the RF signal generator:
   Video: 100 IRE flat field, 30% modulation.
   Audio: 300Hz, 100% modulation, stereo (left only) (70 ±5dB, 75Ω OPEN, P/S 10dB).
3. Adjust the MTS low-level separation adjustment (M02) until the amplitude displayed on the scope is minimum.
4. Apply the following signal from the RF signal generator:
   Video: 100 IRE flat field, 30% modulation.
   Audio: 3KHz, 100% modulation, stereo (left only) (70 ±5dB, 75Ω OPEN, P/S 10dB).
5. Adjust the MTS high-level separation adjustment (M01) until the amplitude displayed on the scope is minimum.
6. Repeat above steps 2 through 5 until the amplitude is at minimum for both signals.
7. Exit Service Mode. Turn off the set. Remove all connections from chassis.

## Clock adjustment

**Service DAC (X03)**

**Preparation:**

Connect the frequency counter from TP5 (TPs port close to tuner) to cold ground(⏚).

***Note:*** *Frequency Counter probe capacitance should be 8pF or less.*

**Procedure:**

1. Measure TP5 for the frequency of the waveform and record the reading.

   ***Note:*** *Measurement must have at least four digits of resolution following the decimal point. Example: 000.0000*

2. In service mode select the clock adjustment DAC (X03).
3. Calculate and set X03 based on the following formula:

$$X03 = 128 + 0.90 \times 10^{6\frac{\{TP - (125)\}}{((125))}}$$

***Note:*** *TP5 measurement will not change regardless of the value stored in X03.*

# Service adjustments (mechanical controls)

## Focus (part of T551)

**Preparation:**

Apply a monoscope pattern.

**Procedure:**

1. Adjust the focus VR, trying to get the better focus as possible at the right side.
2. Confirm a correct focus at the center, then try to adjust “A” in see Fig. 31

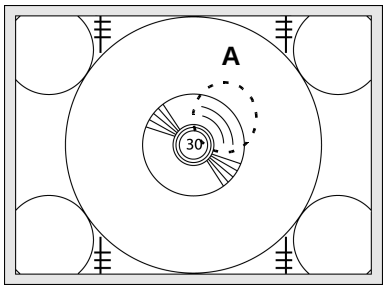



Figure 32. **Focus adjustment**

# Audio signal path block diagram

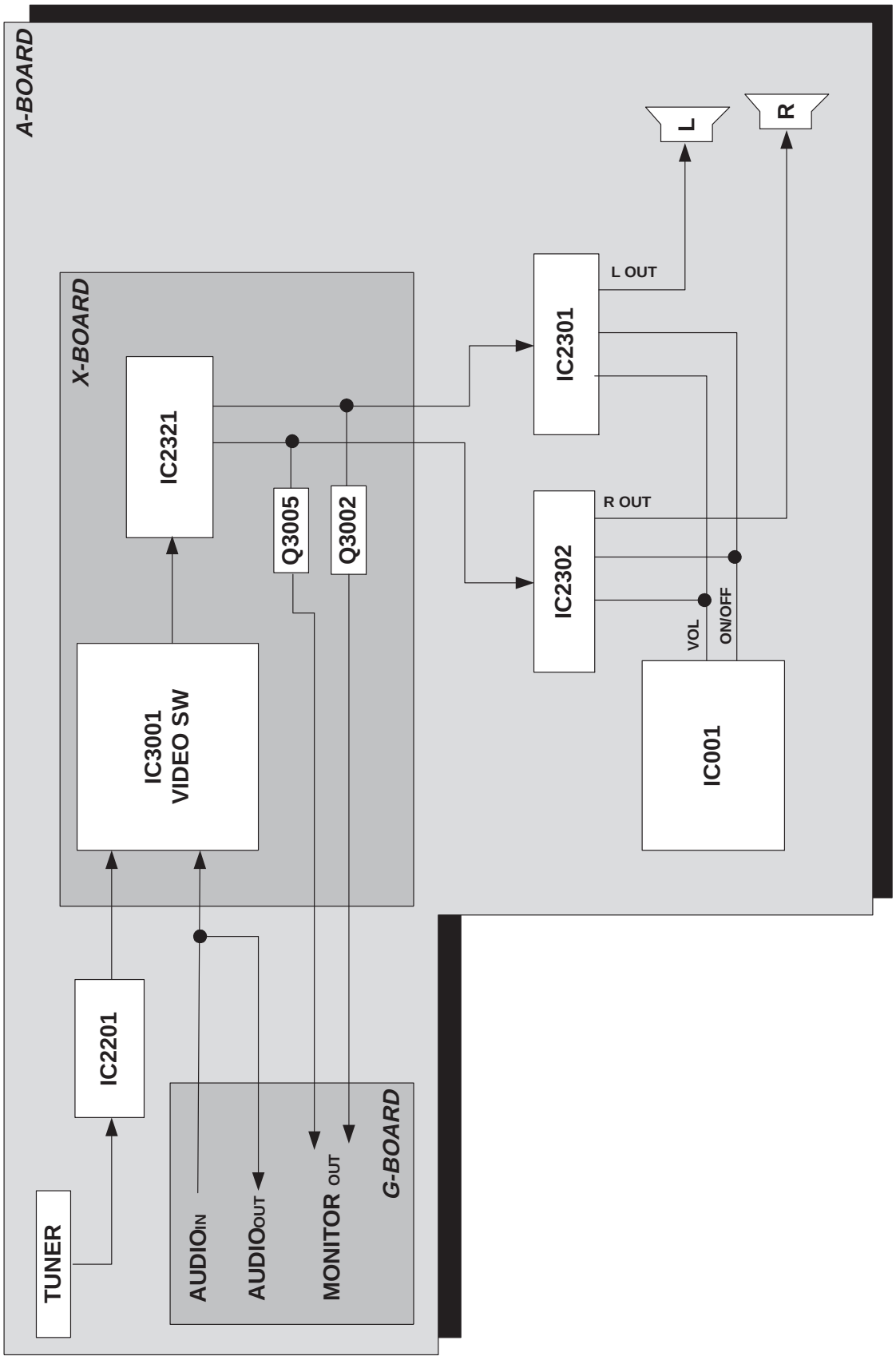



Figure 33. **Audio signal block diagram**

# Video signal path block diagram

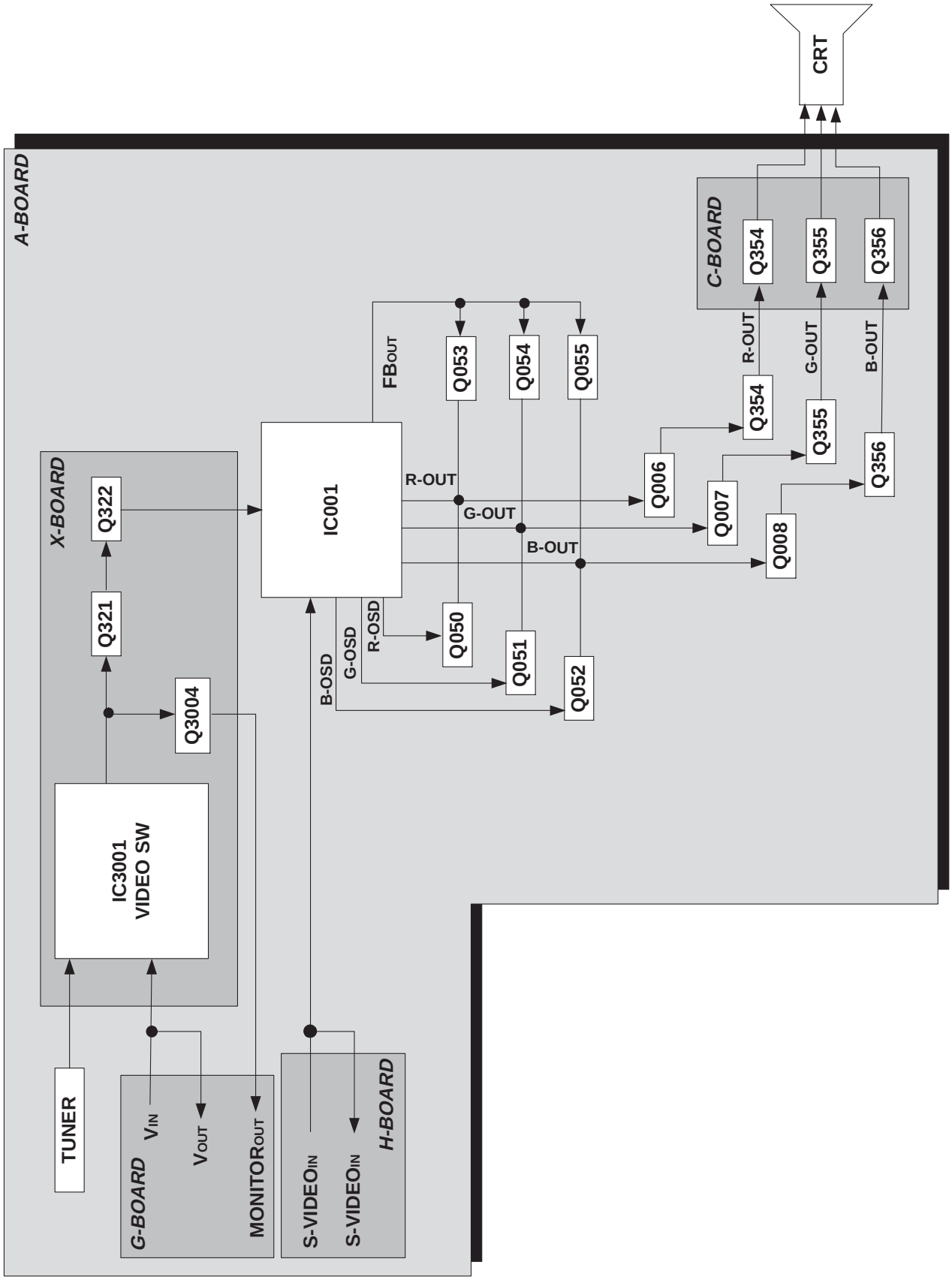



Figure 34. **Video signal block diagram**

# REPLACEMENT PARTS LIST

## Models: CT-1388YD, CT-1389VYD, CT-2088YD, CT-2089VYD, CT-2788YD & CT-2789VYD

**Important Safety Notice**: Components printed in **BOLD TYPE** have special characteristics important for safety. When replacing any of these components use only manufacturer's specified parts.

| REF NO. | PART NO. | DESCRIPTION |
|---|---|---|
| | | ***CAPACITORS*** |
| **C001** | **TCJ2VF1H103Z** | **CAP,C .01UF-Z-50V** |
| C002 | TCJ2VB1H471K | CAP,C 470PF-K-50V |
| C003 | ECA1HM4R7B | CAP,E 4.7UF-50V *CT-1389VYD CT-2089VYD, CT-2789VYD* |
| C004 | TCJ2VC1H150J | CAP,C 15PF-J-50V *CT-1389VYD CT-2089VYD, CT-2789VYD* |
| C005 | TCJ2VC1H150J | CAP,C 15PF-J-50V *CT-1389VYD CT-2089VYD, CT-2789VYD* |
| C008 | TCJ2VF1H104Z | CAP,C .1UF-Z-50V |
| C009 | ECA1CM470B | CAP,E 47UF/16V |
| C010 | TCJ2VF1H104Z | CAP,C .1UF-Z-50V |
| C011 | ECA1CM101B | CAP,E 100UF/16V |
| C015 | ECJ2VB1C224K | CAP,C .22UF-K-16V |
| C016 | TCJ2VC1H101J | CAP,C 100PF-J-50V |
| C017 | TCJ2VB1C104K | CAP,C .1UF-K-16V |
| C018 | TCJ2VC1H151J | CAP,C 150PF-J-50V |
| C022 | TCJ2VC1H101J | CAP,C 100PF-J-50V |
| C023 | TCJ2VC1H151J | CAP,C 150PF-J-50V |
| C024 | ECA1CM470B | CAP,E 47UF/16V |
| C025 | TCJ2VB1C104K | CAP,C .1UF-K-16V |
| C026 | TCJ2VB1C104K | CAP,C .1UF-K-16V |
| C027 | TCJ2VF1H104Z | CAP,C .1UF-Z-50V |
| C028 | TCJ2VB1C104K | CAP,C .1UF-K-16V |
| C029 | ECQB1H333JM3 | CAP,P .033UF-J-50V |
| C031 | ECA1HMR22B | CAP,E .22UF-50V |
| C032 | ECA1VM470B | CAP,E 47UF/35V *CT-1389VYD CT-2089VYD, CT-2789VYD* |
| C033 | TCJ2VC1H390J | CAP,C 39PF-J-50V |
| C034 | TCJ2VF1H103Z | CAP,C .01UF-Z-50V |
| C035 | ECA1HM010B | CAP,E 1UF-50V |
| C036 | TCJ2VF1H103Z | CAP,C .01UF-Z-50V |
| C037 | ECA1HM0R1B | CAP,E 0.1UF/50V |
| C038 | ECA1VM470B | CAP,E 47UF/35V *CT-1389VYD CT-2089VYD, CT-2789VYD* |
| C040 | ECA1CM470B | CAP,E 47UF/16V *CT-1389VYD CT-2089VYD, CT-2789VYD* |
| C041 | ECA1HM2R2B | CAP,E 2.2UF-50V *CT-1389VYD CT-2089VYD, CT-2789VYD* |
| C042 | TCJ2VF1H104Z | CAP,C .1UF-Z-50V |
| C043 | ECA1CM470B | CAP,E 47UF/16V |
| C044 | TCJ2VC1H471J | CAP,C 470PF-J-50V |
| C045 | ECA1HM0R1B | CAP,E 0.1UF/50V |
| C046 | TCJ2VB1C104K | CAP,C .1UF-K-16V |
| C047 | TCJ2VC1H220J | CAP,C 22PF-J-50V |
| C048 | TCJ2VC1H220J | CAP,C 22PF-J-50V |
| C050 | ECA1CM101B | CAP,E 100UF/16V |
| C051 | TCJ2VF1H104Z | CAP,C .1UF-Z-50V |
| C055 | TCJ2VC1H560J | CAP,C 56PF-J-50V *CT-1389VYD CT-2089VYD, CT-2789VYD* |
| C103 | ECA0JM331B | CAP,E 330UF-6.3V |
| C104 | TCJ2VF1H103Z | CAP,C .01UF-Z-50V |
| C105 | ECA0JM101B | CAP,E 100UF-6.3V |
| C201 | TCJ2VB1H332K | CAP,C .0033UF-K-50V |
| | | CT-1389VYD CT-2089VYD |
| C350 | ECA1CM101B | CAP,E 100UF/16V |
| C351 | TCJ2VB1H391K | CAP,C 390PF-K-50V *CT-2088YD, CT-2089VYD CT-2788YD, CT-2789VYD* |
| C351 | TCJ2VB1H471K | CAP,C 470PF-K-50V *CT-1388YD, CT-1389VYD* |
| C352 | TCJ2VB1H391K | CAP,C 390PF-K-50V |
| C353 | TCJ2VB1H471K | CAP,C 470PF-K-50V |
| C354 | ECKW3D102KBN | CAP,C .001UF-K-2KVDC |
| C357 | EEANA1E1R0B | CAP,E 1.0UF-25V |
| C361 | TCJ2VC1H151J | CAP,C 150PF-J-50V |
| C362 | TCJ2VC1H151J | CAP,C 150PF-J-50V |
| C363 | TCJ2VC1H151J | CAP,C 150PF-J-50V |
| C451 | ECA1CHG470B | CAP,E 47UF-16V |
| C452 | ECSF1EE105VB | CAP,E 1.0UF-25V |
| C453 | ECEA1HFS010B | CAP,E 1UF-50V *CT-2877YD, CT-2879VYD* |
| C453 | ECEA1HFS2R2B | CAP,E 2.2UF-50V *CT-2088YD, CT-2089VYD* |
| C453 | ECEA1HFS3R3B | CAP,E 3.3UF-50V *CT-1388YD, CT-1389VYD* |
| C454 | ECA1EM102E | CAP,E 1000UF-25V |
| C455 | ECA1EHG101B | CAP,E 100UF-25V *CT-1388YD, CT-1389VYD CT-2088YD, CT-2089VYD* |
| C455 | ECA1VHG101B | CAP,E 100UF-35V *CT-2788YD, CT-2789VYD* |
| C456 | ECQB1H103JM3 | CAP,P .01UF-J-50V |
| C459 | ECA1VHG471E | CAP,E 470UF-35V |
| C462 | ECA1HM4R7B | CAP,E 4.7UF-50V |
| C502 | TCJ2VC1H471J | CAP,C 470PF-J-50V |
| C503 | TCJ2VB1C104K | CAP,C .1UF-K-16V |
| C504 | TCJ2VB1C104K | CAP,C .1UF-K-16V |
| C510 | ECCR2H100D5 | CAP,C 10PF-D-500V |
| C511 | ECKR2H821KB5 | CAP,C 820PF-K-500V |
| C512 | ECKR2H101KB5 | CAP,C 100UF-K-500V |
| **C531** | **ECA1HM220B** | **CAP,E 22UF-50V** |
| **C551** | **ECA1VM331B** | **CAP,E 330UF-35V** |
| C554 | ECKR2H561KB5 | CAP,C 560PF-K-500V |
| **C555** | **ECA2EM220E** | **CAP,E 22UF-250V** |
| **C556** | **ECA1CM471B** | **CAP,E 470UF-16V** |
| C557 | ECKR2H102KB5 | CAP,C 1000PF-K-500V *CT-2788YD, CT-2789VYD* |
| C557 | ECKR2H222KB5 | CAP,C 2200PF-K-500V *CT-1388YD, CT-1389VYD CT-2088YD, CT-2089VYD* |
| C559 | ECA1HM220B | CAP,E 22UF-50V *CT-1388YD, CT-1389VYD* |
| C560 | ECEA1HN010UB | CAP,E 1UF/50V |
| C561 | ECKR2H561KB5 | CAP,C 560PF-K-500V |

# REPLACEMENT PARTS LIST

## Models: CT-1388YD, CT-1389VYD, CT-2088YD, CT-2089VYD, CT-2788YD & CT-2789VYD

**Important Safety Notice**: Components printed in **BOLD TYPE** have special characteristics important for safety. When replacing any of these components use only manufacturer's specified parts.

| REF NO. | PART NO. | DESCRIPTION |
|---|---|---|
| **C563** | **ECWH12H362JS** | **CAP,P ,0036UF-J-1,2KV** ***CT-2088YD, CT-2089VYD*** |
| **C563** | **ECWH12H752JS** | **CAP,P .0075UF-J-1.2KV** ***CT-1388YD, CT-1389VYD*** |
| **C563** | **ECWH12H822JS** | **CAP,P .0082UF-J-1.2KV** ***CT-2788YD, CT-2789VYD*** |
| **C564** | **ECWH12H472JS** | **CAP,P .0047UF-J-1.2KV** ***CT-2088YD, CT-2089VYD*** |
| **C564** | **ECWH12H562JS** | **CAP,P .0056UF-J-1.2KV** ***CT-2788YD, CT-2789VYD*** |
| **C565** | **ECKW3D181JBP** | **CAP,C 180PF-J-2KV** ***CT-2788YD, CT-2789VYD*** |
| **C565** | **ECKW3D681JBR** | **CAP,C 680PF-J-2KV** ***CT-1388YD, CT-1389VYD*** |
| **C565** | **ECKW3D821JBR** | **CAP,C 820PF-J-2KV** ***CT-2088YD, CT-2089VYD*** |
| **C566** | **ECKW3D181JBP** | **CAP,C 180PF-J-2KV** |
| **C568** | **ECQM4473JZW** | **CAP,P .047UF-J-400V** ***CT-2088YD, CT-2089VYD*** |
| **C568** | **ECWF2274JBB** | **CAP,M .27UF-J-200V** ***CT-2788YD, CT-2789VYD*** |
| **C569** | **ECWF2304JBB** | **CAP,M .3UF-J-200V** ***CT-1388YD, CT-1389VYD*** |
| **C569** | **ECWF2394JBB** | **CAP,P .39UF-J-200V** ***CT-2088YD, CT-2089VYD*** |
| **C569** | **ECWF2474JBB** | **CAP,M .47UF-J-200V** ***CT-2788YD, CT-2789VYD*** |
| C570 | ECA1CM222E | CAP,E 2200UF-16V |
| C571 | ECA1HM220B | CAP,E 22UF-50V |
| C572 | ECA1HM100B | CAP,E 10UF/50V |
| C573 | ECA1CM101B | CAP,E 100UF/16V |
| C575 | ECA0JM222B | CAP,E 2200UF-6.3V |
| C577 | ECA1CM101B | CAP,E 100UF/16V |
| C578 | ECA0JM332B | CAP,E 3300PF-6.3V |
| C579 | TCJ2VC1H100D | CAP,C 10PF-D-50V |
| C605 | TCJ2VF1H103Z | CAP,C .01UF-Z-50V |
| C606 | ECA0JM221B | CAP,E 220UF-6.3V |
| **C801** | **ECKWAE472ZED** | **CAP,C 4700PF-Z-500V** |
| **C802** | **ECKWAE472ZED** | **CAP,C 4700PF-Z-500V** |
| **C803** | **ECKWAE472ZED** | **CAP,C 4700PF-Z-500V** |
| **C805** | **EC0S2DA221BB** | **CAP,E 220UF/200V** ***CT-2088YD, CT-2089VYD*** |
| **C805** | **EC0S2DA331BB** | **CAP,E 330UF/200V** ***CT-2788YD, CT-2789VYD*** |
| **C805** | **EC0S2DG151DG** | **CAP,E 151UF/200V** ***CT-1388YD, CT-1389VYD*** |
| C806 | ECQM4103KZW | CAP,P .01UF-K-400V |
| C807 | ECKR3A821KBP | CAP,C 820PF-K-1KV |
| C808 | ECA1VM101B | CAP,E 100UF-35V |
| C809 | ECKR1H101KB5 | CAP,C 100PF-K-50V |
| C810 | ECKR1H471KB5 | CAP,C 470PF-K-50V |
| **C812** | **ECQU2A224MVA** | **CAP,P .22UF-M-250VAC** |
| **C813** | **ECQU2A153MVA** | **CAP,P .015UF-M-250VAC** |
| **C814** | **ECQU2A153MVA** | **CAP,P .015UF-M-250VAC** |

| REF NO. | PART NO. | DESCRIPTION |
|---|---|---|
| C820 | ECA1CM101B | CAP,E 100UF/16V |
| C821 | TCJ2VF1H103Z | CAP,C .01UF-Z-50V |
| C822 | ECKR3A221KBP | CAP,C 220PF-K-1KV |
| **C823** | **ECA1HM471B** | **CAP,E 470UF-50V** |
| C824 | ECKR3A471KBP | CAP,C 470PF-K-1KV |
| **C825** | **EEUMG2C221S** | **CAP,E 220UF-160V** |
| C826 | ECKR3A471KBP | CAP,C 470PF-K-1KV |
| C827 | ECA1CM221B | CAP,E 10UF-16V |
| **C828** | **ECA160V33UE** | **CAP,E 33UF/160V** |
| C2201 | ECA1HM4R7B | CAP,E 4.7UF-50V *CT-2789VYD* |
| C2202 | ECA1HM2R2B | CAP,E 2.2UF-50V *CT-2789VYD* |
| C2203 | ECA1HM4R7B | CAP,E 4.7UF-50V *CT-2789VYD* |
| C2204 | AP106K016CAE | CAP,T 10UF/16V *CT-2789VYD* |
| C2205 | ECA1HMR33B | CAP,E .33UF-50V *CT-2789VYD* |
| C2206 | ECQB1H223JM3 | CAP,P .022UF-J-50V *CT-2789VYD* |
| C2207 | AP335K016CAE | CAP,T 3.3UF/16V *CT-2789VYD* |
| C2208 | TCJ2VB1C104K | CAP,C .1UF-K-16V *CT-2789VYD* |
| C2209 | TCJ2VB1C104K | CAP,C .1UF-K-16V *CT-2789VYD* |
| C2210 | TCJ2VB1C104K | CAP,C .1UF-K-16V *CT-2789VYD* |
| C2212 | ECQB1H473JM3 | CAP,P .047UF-J-50V *CT-2789VYD* |
| C2213 | ECA1HMR47B | CAP,E .47UF-50V *CT-2789VYD* |
| C2214 | ECA1CM101B | CAP,E 100UF/16V *CT-2789VYD* |
| C2215 | EEANA1E100B | CAP,E 10UF-25V *CT-2789VYD* |
| C2216 | TCJ2VC1H100D | CAP,C 10PF-J-50V *CT-2789VYD* |
| C2301 | ECA1VM102E | CAP,E 1000UF-35V *CT-2788YD, CT-2789VYD* |
| C2302 | ECEA1HN010UB | CAP,E 1UF/50V *CT-2788YD, CT-2789VYD* |
| C2303 | ECA1EM101B | CAP,E 100UF-25V *CT-2788YD, CT-2789VYD* |
| C2304 | ECA1EM100B | CAP,E 10UF-25V *CT-2788YD, CT-2789VYD* |
| C2307 | ECA1CM102B | CAP,E 1000UF/16V *CT-2788YD, CT-2789VYD* |
| C2311 | ECA1VM102E | CAP,E 1000UF-35V |
| C2312 | ECEA1HN010UB | CAP,E 1UF/50V |
| C2313 | ECA1EM101B | CAP,E 100UF-25V |
| C2314 | ECA1CM100B | CAP,E 10UF-16V |
| C2317 | ECA1CM102B | CAP,E 1000UF/16V |
| C2320 | ECA1CM100B | CAP,E 10UF-16V *CT-2788YD, CT-2789VYD* |
| C2330 | ECA1CM100B | CAP,E 10UF-16V |
| C2333 | ECA1HM0R1B | CAP,E 0.1UF/50V *CT-2788YD, CT-2789VYD* |
| C2334 | TCJ2VB1H472K | CAP,C 4700PF-K-50V *CT-2788YD, CT-2789VYD* |
| C2335 | ECA1CM470B | CAP,E 47UF/16V *CT-2788YD, CT-2789VYD* |
| C2336 | ECQB1H104JM3 | CAP,P .1UF-J-50V *CT-2788YD,CT-2789VYD* |
| C2337 | ECA1HM0R1B | CAP,E 0.1UF/50V *CT-2788YD, CT-2789VYD* |
| C2338 | ECA1HM4R7B | CAP,E 4.7UF-50V *CT-2788YD, CT-2789VYD* |

# REPLACEMENT PARTS LIST

## Models: CT-1388YD, CT-1389VYD, CT-2088YD, CT-2089VYD, CT-2788YD & CT-2789VYD

**Important Safety Notice**: Components printed in **BOLD TYPE** have special characteristics important for safety. When replacing any of these components use only manufacturer's specified parts.

| REF NO. | PART NO. | DESCRIPTION |
|---|---|---|
| C2339 | ECA1EM100B | CAP,E 10UF-25V *CT-2788YD, CT-2789VYD* |
| C2340 | ECA1HMR47B | CAP,E .47UF-50V *CT-2788YD, CT-2789VYD* |
| C2341 | ECA1HM4R7B | CAP,E 4.7UF-50V *CT-2788YD, CT-2789VYD* |
| C2342 | ECA1HM4R7B | CAP,E 4.7UF-50V *CT-2788YD, CT-2789VYD* |
| C2343 | ECA1HM4R7B | CAP,E 4.7UF-50V *CT-2788YD ,CT-2789VYD* |
| C2344 | TCJ2VB1H472K | CAP,C 4700PF-K-50V *CT-2788YD, CT-2789VYD* |
| C2345 | ECA1HM0R1B | CAP,E 0.1UF/50V *CT-2788YD, CT-2789VYD* |
| C2346 | ECA1CM470B | CAP,E 47UF/16V *CT-2788YD, CT-2789VYD* |
| C2347 | TCUV1H103KBN | CAP,C .01UF-K-50V *CT-2788YD, CT-2789VYD* |
| C2350 | ECA1HM4R7B | CAP,E 4.7UF-50V |
| C3001 | ECEA1HKN0R1B | CAP,E .1UF-50V |
| C3005 | TCJ2VF1H103Z | CAP,C .01UF-Z-50V *CT-1388YD CT-1389VYD, CT-2088YD CT-2089VYD, CT-2789VYD* |
| C3007 | ECA1CM100B | CAP,E 10UF-16V *CT-1388YD, CT-1389VYD CT-2088YD, CT-2089VYD* |
| C3008 | ECA1HM010B | CAP,E 1UF-50V *CT-1388YD, CT-1389VYD CT-2088YD, CT-2089VYD* |
| C3009 | ECA1HM010B | CAP,E 1UF-50V *CT-1388YD, CT-1389VYD CT-2088YD, CT-2089VYD* |
| C3010 | ECA1HM010B | CAP,E 1UF-50V *CT-1388YD CT-1389VYD, CT-2088YD CT-2089VYD, CT-2789VYD* |
| C3014 | ECEA1HN010UB | CAP,E 1UF/50V *CT-2789VYD* |
| C3016 | ECA1CM470B | CAP,E 47UF/16V *CT-1388YD CT-1389VYD, CT-2088YD CT-2089VYD, CT-2789VYD* |
| C3020 | ECA1CM471B | CAP,E 470UF-16V *CT-1388YD CT-1389VYD, CT-2088YD CT-2089VYD, CT-2789VYD* |
| C3021 | ECA1HM010B | CAP,E 1UF-50V *CT-2789VYD* |
| C3021 | ECEA1HU010E | CAP,E 1UF/50V *CT-1389VYD, CT-2089VYD* |
| C3022 | ECA1CM101B | CAP,E 100UF/16V *CT-1388YD CT-1389VYD, CT-2088YD CT-2089VYD, CT-2789VYD* |
| C3023 | ECA1HM010B | CAP,E 1UF-50V *CT-2789VYD* |
| C3024 | ECEA1HN010UB | CAP,E 1UF/50V *CT-2789VYD* |
| C3025 | ECEA1CN470UE | CAP,E 47UF-16V *CT-1389VYD CT-2089VYD, CT-2789VYD* |
| C3026 | ECA1CM100B | CAP,E 10UF-16V |
| C3027 | TCJ2VF1H103Z | CAP,C .01UF-Z-50V *CT-1388YD CT-1389VYD, CT-2088YD CT-2089VYD, CT-2789VYD* |

| REF NO. | PART NO. | DESCRIPTION |
|---|---|---|
| C3028 | ECA1CM100B | CAP,E 10UF-16V CT-1388YD, CT-1389VYD CT-2088YD, CT-2089VYD |
| C3030 | ECA1CM100B | CAP,E 10UF-16V *CT-1388YD CT-1389VYD, CT-2088YD CT-2089VYD, CT-2789VYD* |
| C3031 | ECA1CM100B | CAP,E 10UF-16V *CT-2789VYD* |
| C3032 | ECEA1HN010UB | CAP,E 1UF/50V *CT-1388YD CT-1389VYD, CT-2088YD CT-2089VYD, CT-2789VYD* |
| C3040 | ECEA1CN100UB | CAP,E 10UF-16V *CT-2788YD, CT-2789VYD* |
| C3041 | ECEA1CN100UB | CAP,E 10UF-16V *CT-2788YD, CT-2789VYD* |
| C3042 | ECA1CM470B | CAP,E 47UF/16V *CT-2789VYD* |
| C3043 | ECEA1HN010UB | CAP,E 1UF/50V *CT-1388YD, CT-1389VYD CT-2088YD, CT-2089VYD* |
| C3050 | TCJ2VF1H103Z | CAP,C .01UF-Z-50V |
| C3051 | TCJ2VF1H103Z | CAP,C .01UF-Z-50V |
| | | ***DIODES*** |
| D002 | MA165TA5VT | DIODE, SWITCHING |
| D006 | MA4330HTA | DIODE *CT-1389VYD CT-2089VYD, CT-2789VYD* |
| D052 | MA4068MTA | DIODE, ZENER |
| D053 | MA4056MTA | DIODE |
| D055 | MA4056MTA | DIODE |
| D451 | ERA15-01V3 | DIODE, RECTIFIER |
| D452 | MA4047MTA | DIODE |
| D453 | MA165TA5VT | DIODE, SWITCHING |
| D454 | MA165TA5VT | DIODE, SWITCHING |
| D456 | MA4047MTA | DIODE *CT-2088YD, CT-2089VYD* |
| D502 | MA4047MTA | DIODE |
| **D531** | **AS01V0** | **DIODE** |
| **D551** | **D1NL20UV70** | **DIODE** |
| **D554** | **AU02V0** | **DIODE** |
| D558 | RS3FS | DIODE *CT-2088YD, CT-2089VYD CT-2788YD, CT-2789VYD* |
| D559 | BYD33G-113 | DIODE *CT-2088YD, CT-2089VYD CT-2788YD, CT-2789VYD* |
| **D561** | **AU02V0** | **DIODE** |
| D571 | MA165TA5VT | DIODE, SWITCHING |
| D606 | MA165TA5VT | DIODE, SWITCHING |
| D607 | MA152KTX | DIODE |
| D608 | MA152KTX | DIODE |
| D609 | MA152KTX | DIODE |
| **D801** | **D3SBA60-4103** | **DIODE** |
| **D806** | **TAP2AA0001** | **DIODE (THERMISTOR)** ***CT-1388YD, CT-1389VYD CT-2088YD, CT-2089VYD*** |
| **D806** | **TAP4GA0006** | **DIODE (THERMISTOR)** ***CT-2788YD, CT-2789VYD*** |
| D808 | SARS01V1 | DIODE |

# REPLACEMENT PARTS LIST

## Models: CT-1388YD, CT-1389VYD, CT-2088YD, CT-2089VYD, CT-2788YD & CT-2789VYD

**Important Safety Notice**: Components printed in **BOLD TYPE** have special characteristics important for safety. When replacing any of these components use only manufacturer's specified parts.

| REF NO. | PART NO. | DESCRIPTION |
|---|---|---|
| D809 | AG01V0 | DIODE |
| D810 | AG01V0 | DIODE |
| D811 | AG01V0 | DIODE |
| **D812** | **MA4068MTA** | **DIODE, ZENER** |
| D820 | MA165TA5VT | DIODE, SWITCHING |
| D821 | MA4047HTA | DIODE |
| D822 | RN1ZLF-B1 | DIODE |
| **D823** | **S3L60P154004** | **DIODE** |
| D824 | D1NL20UV70 | DIODE |
| D2350 | MA4068MTA | DIODE, ZENER |
| D2351 | MA165TA5VT | DIODE, SWITCHING |
| D2352 | MA165TA5VT | DIODE, SWITCHING |
| D2353 | MA165TA5VT | DIODE, SWITCHING |
| D2354 | MA4091MTA | DIODE |
| D3001 | MA3110MTX | DIODE, ZENER |
| D3082 | MA4110MTA | DIODE, ZENER *CT-1388YD, CT-1389VYD CT-2088YD, CT-2089VYD* |
| D3083 | MA4110MTA | DIODE, ZENER *CT-1388YD, CT-1389VYD CT-2088YD, CT-2089VYD* |
| D3084 | MA4110MTA | DIODE, ZENER |
| D3085 | MA4110MTA | DIODE, ZENER |
| D3086 | MA4110MTA | DIODE, ZENER |
| D3087 | MA4110MTA | DIODE, ZENER |
| D3088 | MA4110MTA | DIODE, ZENER *CT-1388YD CT-1389VYD, CT-2088YD CT-2089VYD, CT-2789VYD* |
| D3089 | MA4110MTA | DIODE, ZENER *CT-1388YD CT-1389VYD ,CT-2088YD CT-2089VYD, CT-2789VYD* |
| D3090 | MA4110MTA | DIODE, ZENER |
| D3091 | MA4110MTA | DIODE, ZENER |
| D3092 | MA4110MTA | DIODE, ZENER *CT-1388YD, CT-1389VYD CT-2088YD, CT-2089VYD* |
| D3093 | MA4110MTA | DIODE, ZENER *CT-1388YD, CT-1389VYD CT-2088YD, CT-2089VYD* |
| D3094 | MA4110MTA | DIODE, ZENER *CT-1388YD CT-1389VYD, CT-2088YD CT-2089VYD, CT-2789VYD* |
| D3095 | MA4110MTA | DIODE, ZENER *CT-1388YD CT-1389VYD, CT-2088YD CT-2089VYD, CT-2789VYD* |
| D3096 | MA4110MTA | DIODE, ZENER *CT-1388YD, CT-1389VYD CT-2088YD, CT-2089VYD* |
| D3097 | MA4110MTA | DIODE, ZENER *CT-1388YD, CT-1389VYD CT-2088YD, CT-2089VYD* |
| D3098 | MA4110MTA | DIODE, ZENER *CT-2789VYD* |
| D3099 | MA4110MTA | DIODE, ZENER *CT-2789VYD* |
| D3200 | MA4120TA | DIODE, ZENER |
| D3201 | MA4120TA | DIODE, ZENER *CT-1388YD ,CT-1389VYD CT-2088YD, CT-2089VYD* |
| D3202 | MA4120TA | DIODE, ZENER *CT-1388YD ,CT-1389VYD CT-2088YD ,CT-2089VYD* |
| D3203 | MA3110MTX | DIODE, ZENER |
| D3204 | MA3110MTX | DIODE, ZENER |
| D3206 | MA3110MTX | DIODE, ZENER *CT-1388YD CT-1389VYD ,CT-2088YD CT-2089VYD, CT-2789VYD* |
| D3208 | MA3110MTX | DIODE, ZENER *CT-1388YD CT-1389VYD ,CT-2088YD CT-2089VYD, CT-2789VYD* |
| | | ***FUSES*** |
| **F801** | **XBA2A00101** | **FUSE 6.3A 125V** |
| | | ***INTEGRATED CIRCUITS*** |
| **IC001** | **M65580MAPB00** | **MPU** |
| IC002 | C3EAEC000016 | EEPROM |
| IC003 | PIC-37042SR | IR REMOTE SENSOR *CT-1389VYD CT-2089VYD, CT-2789VYD* |
| IC005 | PQ1R33 | 3.3V REGULATOR |
| IC006 | MN1280R | RESET |
| IC050 | TC74HC4066AL | HALFTONE |
| **IC451** | **LA7837-TV** | **VERTICAL OUT *CT-1388YD, CT-1389VYD CT-2088YD,CT-2089VYD*** |
| **IC451** | **LA7838** | **VERTICAL OUT *CT-2788YD, CT-2789VYD*** |
| IC551 | AN78L09 | 9V REGULATOR *CT-1388YD CT-2088YD, CT-2788YD* |
| IC551 | AN78M09LB | 9V REGULATOR *CT-1389VYD CT-2089VYD, CT-2789VYD* |
| **IC552** | **AN78M05LB** | **PLUS 5V AVR** |
| **IC553** | **AN78M05LB** | **PLUS 5V AVR** |
| **IC801** | **STRG5623** | **MAIN REGULATOR *CT-1388YD, CT-1389VYD CT-2088YD, CT-2089VYD*** |
| **IC801** | **STRG5624** | **MAIN REGULATOR *CT-2788YD, CT-2789VYD*** |
| IC2201 | AN5829S-E1V | MTS, S-AGC *CT-2789VYD* |
| IC2301 | AN17802A | AUDIO AMPLIFIER *CT-2788YD, CT-2789VYD* |
| IC2302 | AN17800A | AUDIO AMPLIFIER *CT-1388YD ,CT-1389VYD CT-2088YD, CT-2089VYD* |
| IC2302 | AN17802A | AUDIO AMPLIFIER *CT-2788YD, CT-2789VYD* |
| IC2321 | CXA2021S | AUDIO CONTROL *CT-2788YD, CT-2789VYD* |
| IC3001 | M52472P | A/V SWITCH *CT-1388YD CT-1389VYD ,CT-2088YD CT-2089VYD, CT-2789VYD* |
| | | ***COILS*** |
| J325 | EXCELSA35V | FERRITE BEAD |

# REPLACEMENT PARTS LIST

## Models: CT-1388YD, CT-1389VYD, CT-2088YD, CT-2089VYD, CT-2788YD & CT-2789VYD

**Important Safety Notice**: Components printed in **BOLD TYPE** have special characteristics important for safety. When replacing any of these components use only manufacturer's specified parts.

| REF NO. | PART NO. | DESCRIPTION |
|---|---|---|
| LC005 | EXCEMT332DT | EMI FILTER *CT-2088YD, CT-2089VYD CT-2788YD, CT-2789VYD* |
| LC007 | EXCEMT332DT | EMI FILTER *CT-2088YD, CT-2089VYD CT-2788YD, CT-2789VYD* |
| LC013 | EXCEMT332DT | EMI FILTER *CT-2088YD, CT-2089VYD CT-2788YD, CT-2789VYD* |
| LC018 | EXCEMT332DT | EMI FILTER *CT-2088YD, CT-2089VYD CT-2788YD, CT-2789VYD* |
| L001 | EXCELSA35T | FERRITE BEAD *CT-1388YD CT-2088YD, CT-2089VYD CT-2788YD ,CT-2789VYD* |
| L003 | TLUABTA2R2K | COIL, PEAKING 2.2UH |
| L004 | TLUABTA2R2K | COIL, PEAKING 2.2UH |
| L005 | EXCELDR35V | FERRITE BEAD *CT-1388YD, CT-1389VYD* |
| L006 | EXCELSA24T | FERRITE BEAD |
| L007 | EXCELDR35V | FERRITE BEAD *CT-1388YD, CT-1389VYD* |
| L008 | TLUABTA470K | COIL, PEAKING 47UH *CT-1389VYD CT-2089VYD, CT-2789VYD* |
| L009 | EXCELSA35V | FERRITE BEAD *CT-1389VYD CT-2089VYD, CT-2789VYD* |
| L010 | ELESN330JA | COIL, PEAKING 33UH *CT-1389VYD CT-2089VYD, CT-2789VYD* |
| L011 | ELESN330JA | COIL, PEAKING 33UH *CT-1389VYD CT-2089VYD, CT-2789VYD* |
| L013 | EXCELDR35V | FERRITE BEAD *CT-1388YD CT-1389VYD* |
| L014 | ELESN180KA | COIL, PEAKING 18UH *CT-1389VYD CT-2089VYD, CT-2789VYD* |
| L015 | EXCELSA35V | FERRITE BEAD |
| L016 | EXCELSA35V | FERRITE BEAD |
| L017 | TLUABTA100K | COIL, PEAKING 10UH |
| L018 | TLUABTA150K | COIL, PEAKING 15UH |
| L019 | EXCELDR25V | FERRITE BEAD *CT-1388YD* |
| L019 | EXCELDR35V | FERRITE BEAD *CT-1389VYD* |
| L090 | EXCELSA24T | FERRITE BEAD |
| L102 | EXCELDR35V | FERRITE BEAD *CT-1388YD, CT-2088YD* |
| L104 | TLUABTA2R2K | COIL, PEAKING 2.2UH |
| L108 | EXCELSA35V | FERRITE BEAD |
| L211 | EXCELSA35V | FERRITE BEAD *CT-1388YD, CT-1389VYD* |
| L245 | EXCELSA35V | FERRITE BEAD |
| L250 | EXCELSA35V | FERRITE BEAD *CT-1389VYD CT-2089VYD, CT-2789VYD* |
| L306 | TLUABTA2R2K | COIL, PEAKING 2.2UH |
| L325 | EXCELSA35V | FERRITE BEAD |
| L351 | TLTABT101K | LINE FILTER *CT-2788YD, CT-2789VYD* |
| L351 | TLTABT470K | COIL, PEAKING 47UH *CT-1388YD, CT-1389VYD* |
| L403 | TLUABTA2R2K | COIL, PEAKING 2.2UH |
| L416 | EXCELSA39V | FERRITE BEAD |
| **L551** | **ELH5L4101** | **COIL *CT-2088YD, CT-2089VYD*** |
| **L551** | **ELH5L4136** | **COIL *CT-1388YD, CT-1389VYD*** |
| **L551** | **ELH5L7103** | **COIL *CT-2788YD, CT-2789VYD*** |
| L552 | EXCELSA24T | FERRITE BEAD *CT-1388YD, CT-1389VYD* |
| L553 | EXCELSA24T | FERRITE BEAD *CT-1388YD, CT-1389VYD* |
| **L801** | **ELF15N011A** | **LINE FILTER *CT-2088YD, CT-2089VYD*** |
| **L801** | **ELF15N013A** | **LINE FILTER *CT-1388YD, CT-1389VYD*** |
| **L801** | **ELF20N020A** | **COIL, 2UH *CT-2788YD, CT-2789VYD*** |
| L802 | ELEIN470KA | COIL, PEAKING *CT-2788YD, CT-2789VYD* |
| L802 | ELEIN680KA | COIL, PEAKING 68UH *CT-1388YD, CT-1389VYD CT-2088YD, CT-2089VYD* |
| L803 | TALL08T680KA | LINE FILTER |
| L805 | ELEIE220KA | COIL 22UH |
| L2305 | EXCELSA35V | FERRITE BEAD |
| L2350 | ELESN4R7JA | COIL, PEAKING 4.7UH |
| | | ***TRANSISTORS*** |
| Q001 | 2SD601ARTX | TRANSISTOR |
| Q006 | 2SB709ARTX | TRANSISTOR |
| Q007 | 2SB709ARTX | TRANSISTOR |
| Q008 | 2SB709ARTX | TRANSISTOR |
| Q009 | 2SC1473A | TRANSISTOR |
| Q050 | 2SB709ARTX | TRANSISTOR |
| Q051 | 2SB709ARTX | TRANSISTOR |
| Q052 | 2SB709ARTX | TRANSISTOR |
| Q053 | 2SD601ARTX | TRANSISTOR |
| Q054 | 2SD601ARTX | TRANSISTOR |
| Q055 | 2SD601ARTX | TRANSISTOR |
| Q090 | 2SB709ARTX | TRANSISTOR |
| Q092 | 2SB709ARTX | TRANSISTOR |
| Q321 | 2SB709ARTX | TRANSISTOR *CT-1388YD CT-1389VYD, CT-2088YD CT-2089VYD, CT-2789VYD* |
| Q322 | 2SD601ARTX | TRANSISTOR *CT-1388YD CT-1389VYD, CT-2088YD CT-2089VYD, CT-2789VYD* |
| Q351 | 2SC1573NC | TRANSISTOR *CT-1388YD, CT-1389VYD* |
| Q351 | 2SC3063RL | TRANSISTOR *CT-2088YD, CT-2089VYD CT-2788YD, CT-2789VYD* |
| Q352 | 2SC1573NC | TRANSISTOR *CT-1388YD, CT-1389VYD* |

# REPLACEMENT PARTS LIST

## Models: CT-1388YD, CT-1389VYD, CT-2088YD, CT-2089VYD, CT-2788YD & CT-2789VYD

**Important Safety Notice**: Components printed in **BOLD TYPE** have special characteristics important for safety. When replacing any of these components use only manufacturer's specified parts.

| REF NO. | PART NO. | DESCRIPTION |
|---|---|---|
| Q352 | 2SC3063RL | TRANSISTOR *CT-2088YD, CT-2089VYD CT-2788YD, CT-2789VYD* |
| Q353 | 2SC1573NC | TRANSISTOR *CT-1388YD, CT-1389VYD* |
| Q353 | 2SC3063RL | TRANSISTOR *CT-2088YD, CT-2089VYD CT-2788YD, CT-2789VYD* |
| Q354 | 2SD601ARTX | TRANSISTOR |
| Q355 | 2SD601ARTX | TRANSISTOR |
| Q356 | 2SD601ARTX | TRANSISTOR |
| Q451 | 2SD601ARTX | TRANSISTOR |
| Q452 | 2SD601ARTX | TRANSISTOR |
| Q453 | 2SD601ARTX | TRANSISTOR |
| Q501 | 2SC1573AH | TRANSISTOR *CT-1388YD, CT-1389VYD CT-2088YD, CT-2089VYD* |
| Q501 | 2SC4212HLB | TRANSISTOR *CT-2788YD, CT-2789VYD* |
| Q505 | 2SD601ARTX | TRANSISTOR |
| Q520 | 2SD601ARTX | TRANSISTOR |
| **Q551** | **2SC5339LBMA1** | **TRANSISTOR *CT-2788YD, CT-2789VYD*** |
| **Q551** | **2SD2499LBMA2** | **TRANSISTOR *CT-1388YD, CT-1389VYD CT-2088YD, CT-2089VYD*** |
| Q605 | 2SB709ARTX | TRANSISTOR |
| Q606 | 2SD601ARTX | TRANSISTOR |
| Q820 | 2SA1767QTA | TRANSISTOR |
| Q830 | 2SB1011QRL | TRANSISTOR |
| Q2350 | 2SB709ARTX | TRANSISTOR |
| Q3002 | 2SD601ARTX | TRANSISTOR *CT-2789VYD* |
| Q3004 | 2SD601ARTX | TRANSISTOR *CT-1388YD CT-1389VYD, CT-2088YD CT-2089VYD, CT-2789VYD* |
| Q3005 | 2SD601ARTX | TRANSISTOR *CT-1388YD CT-1389VYD, CT-2088YD CT-2089VYD, CT-2789VYD* |
| Q3006 | 2SD601ARTX | TRANSISTOR *CT-1388YD, CT-1389VYD CT-2088YD, CT-2089VYD* |
| | | ***RELAYS*** |
| **RL801** | **TSEH0005** | **RELAY** |
| | | ***RESISTORS*** |
| R001 | ERJ6GEYJ102V | RES,M 1K-J-1/10W |
| R003 | ERJ6GEYJ105V | RES,M 1M-J-1/10W |
| R004 | ERJ6GEYJ562V | RES,M 5.6K-J-1/10W |
| R006 | ERDS2TJ101T | RES,C 100-J-1/4W |
| R007 | ERJ6GEYJ471V | RES,M 470-J-1/10W |
| R008 | ERJ6GEYJ471V | RES,M 470-J-1/10W |
| R009 | ERJ6GEYJ472V | RES,M 4.7K-J-1/10W |
| R010 | ERJ6GEYJ682V | RES,M 6.8K-J-1/10W |
| R011 | ERJ6GEYJ682V | RES,M 6.8K-J-1/10W |
| R012 | ERJ6GEYJ473V | RES,M 47K-J-1/10W |
| R013 | ERJ6GEYJ202V | RES,M 2K-J-1/10W |

| REF NO. | PART NO. | DESCRIPTION |
|---|---|---|
| R014 | ERJ6GEYJ221V | RES,M 220-J-1/10W |
| R015 | ERJ6GEYJ221V | RES,M 220-J-1/10W |
| R016 | ERJ6GEYJ221V | RES,M 220-J-1/10W |
| R017 | ERJ6GEYJ681V | RES,M 680-J-1/10W |
| R018 | ERJ6GEYJ681V | RES,M 680-J-1/10W |
| R019 | ERJ6GEYJ681V | RES,M 680-J-1/10W |
| R021 | ERJ6GEYJ101V | RES,M 100-J-1/10W |
| R022 | ERJ6GEYJ101V | RES,M 100-J-1/10W |
| R023 | ERJ6GEYJ102V | RES,M 1K-J-1/10W |
| R024 | ERJ6GEYJ153V | RES,M 15K-J-1/10W |
| R028 | ERJ6GEYJ472V | RES,M 4.7K-J-1/10W |
| R029 | ERJ6GEYJ472V | RES,M 4.7K-J-1/10W |
| R032 | ERJ6ENF1002V | RES,M 10K-F-1/10W |
| R033 | ERJ6GEYJ222V | RES,M 2.2K-J-1/10W |
| R034 | ERJ6GEYJ222V | RES,M 2.2K-J-1/10W |
| R035 | ERJ6GEYJ332V | RES,M 3.3K-J-1/10W |
| R036 | ERJ6GEYJ562V | RES,M 5.6K-J-1/10W |
| R037 | ERJ6GEYJ103V | RES,M 10K-J-1/10W |
| R038 | ERJ6GEYJ223V | RES,M 22K-J-1/10W |
| R039 | ERJ6GEYJ102V | RES,M 1K-J-1/10W |
| R040 | ERJ6GEYJ223V | RES,M 22K-J-1/10W |
| R041 | ERJ6GEYJ153V | RES,M 15K-J-1/10W |
| R042 | ERJ6GEYJ392V | RES,M 3.9K-J-1/10W |
| R043 | ERJ6GEYJ103V | RES,M 10K-J-1/10W *CT-1389VYD, CT-2089VYD* |
| R043 | ERJ6GEYJ222V | RES,M 2.2K-J-1/10W *CT-2788YD* |
| R043 | ERJ6GEYJ472V | RES,M 4.7K-J-1/10W *CT-2789VYD* |
| R043 | ERJ6GEYJ912V | RES,M 9.1K-J-1/10W *CT-1388YD* |
| R044 | ERJ6GEYJ103V | RES,M 10K-J-1/10W *CT-2088YD* |
| R044 | ERJ6GEYJ153V | RES,M 15K-J-1/10W *CT-2788YD, CT-2789VYD* |
| R044 | ERJ6GEYJ182V | RES,M 1.8K-J-1/10W *CT-1389VYD* |
| R044 | ERJ6GEYJ752V | RES,M 7.5K-J-1/10W *CT-1388YD* |
| R046 | ERJ6GEYJ102V | RES,M 1K-J-1/10W *CT-1389VYD CT-2089VYD, CT-2789VYD* |
| R062 | ERJ6GEYJ122V | RES,M 1.2K-J-1/10W |
| R063 | ERJ6GEYJ122V | RES,M 1.2K-J-1/10W |
| R064 | ERJ6GEYJ122V | RES,M 1.2K-J-1/10W |
| R065 | ERJ6GEYJ272V | RES,M 2.7K-J-1/10W |
| R066 | ERJ6GEYJ272V | RES,M 2.7K-J-1/10W |
| R067 | ERJ6GEYJ272V | RES,M 2.7K-J-1/10W |
| R068 | ERJ6GEYJ182V | RES,M 1.8K-J-1/10W *CT-2088YD, CT-2089VYD CT-2788YD, CT-2789VYD* |
| R068 | ERJ6GEYJ242V | RES,M 2.4K-J-1/10W *CT-1388YD, CT-1389VYD* |
| R069 | ERJ6GEYJ682V | RES,M 6.8K-J-1/10W |
| R070 | ERJ6GEYJ102V | RES,M 1K-J-1/10W |
| R071 | ERJ6GEYJ102V | RES,M 1K-J-1/10W |
| R072 | ERJ6GEYJ102V | RES,M 1K-J-1/10W |
| R077 | ERJ6GEYJ103V | RES,M 10K-J-1/10W *CT-1388YD CT-1389VYD, CT-2088YD CT-2089VYD, CT-2789VYD* |

# REPLACEMENT PARTS LIST

## Models: CT-1388YD, CT-1389VYD, CT-2088YD, CT-2089VYD, CT-2788YD & CT-2789VYD

**Important Safety Notice**: Components printed in **BOLD TYPE** have special characteristics important for safety. When replacing any of these components use only manufacturer's specified parts.

| REF NO. | PART NO. | DESCRIPTION |
|---|---|---|
| R078 | ERJ6GEYJ103V | RES,M 10K-J-1/10W |
| R079 | ERJ6GEYJ103V | RES,M 10K-J-1/10W *CT-1388YD CT-1389VYD, CT-2088YD CT-2089VYD, CT-2789VYD* |
| R080 | ERJ6GEYJ103V | RES,M 10K-J-1/10W *CT-1388YD CT-1389VYD, CT-2088YD CT-2089VYD, CT-2789VYD* |
| R081 | ERJ6GEYJ103V | RES,M 10K-J-1/10W |
| R090 | ERJ6GEYJ471V | RES,M 470-J-1/10W |
| R091 | ERJ6GEYJ185V | RES,M 1.8MEG-J-1/10W |
| R092 | ERJ6GEYJ473V | RES,M 47K-J-1/10W |
| R093 | ERJ6GEYJ331V | RES,M 330-J-1/10W |
| R202 | ERJ6GEYJ751V | RES,M 750-J-1/10W *CT-2789VYD* |
| R251 | ERDS1TJ181T | RES,C 180-J-1/2W *CT-1388YD, CT-1389VYD* |
| R347 | ERJ6GEYJ471V | RES,M 470-J-1/10W *CT-1388YD CT-1389VYD, CT-2088YD CT-2089VYD, CT-2789VYD* |
| R351 | ERG2FJ123H | RES,M 12K-J-2W |
| R352 | ERG2FJ123H | RES,M 12K-J-2W |
| R353 | ERG2FJ123H | RES,M 12K-J-2W *CT-2088YD, CT-2089VYD CT-2788YD, CT-2789VYD* |
| R354 | ERDS1TJ272T | RES,C 2.7K-J-1/2W *CT-2088YD, CT-2089VYD CT-2788YD, CT-2789VYD* |
| R355 | ERDS1TJ272T | RES,C 2.7K-J-1/2W *CT-2088YD, CT-2089VYD CT-2788YD, CT-2789VYD* |
| R356 | ERDS1TJ272T | RES,C 2.7K-J-1/2W *CT-2088YD, CT-2089VYD CT-2788YD, CT-2789VYD* |
| R357 | ERJ6ENF5100V | RES,M 510-F-1/10W *CT-2088YD, CT-2089VYD CT-2788YD, CT-2789VYD* |
| R357 | ERJ6ENF6200V | RES,M 620-F-1/10W *CT-1388YD, CT-1389VYD* |
| R358 | ERJ6ENF5100V | RES,M 510-F-1/10W *CT-2088YD, CT-2089VYD CT-2788YD, CT-2789VYD* |
| R358 | ERJ6ENF6200V | RES,M 620-F-1/10W *CT-1388YD, CT-1389VYD* |
| R359 | ERJ6ENF5100V | RES,M 510-F-1/10W *CT-2088YD, CT-2089VYD CT-2788YD, CT-2789VYD* |
| R359 | ERJ6ENF6200V | RES,M 620-F-1/10W *CT-1388YD, CT-1389VYD* |
| R360 | ERJ6ENF4700V | RES,M 470-F-1/10W *CT-2788YD, CT-2789VYD* |
| R360 | ERJ6ENF5100V | RES,M 510-F-1/10W *CT-2088YD, CT-2089VYD* |
| R360 | ERJ6ENF6200V | RES,M 620-F-1/10W *CT-1388YD, CT-1389VYD* |
| R361 | ERJ6ENF4700V | RES,M 470-F-1/10W *CT-2788YD, CT-2789VYD* |
| R361 | ERJ6ENF5100V | RES,M 510-F-1/10W *CT-2088YD, CT-2089VYD* |

| REF NO. | PART NO. | DESCRIPTION |
|---|---|---|
| R361 | ERJ6ENF6200V | RES,M 620-F-1/10W *CT-1388YD, CT-1389VYD* |
| R362 | ERJ6ENF4700V | RES,M 470-F-1/10W *CT-2788YD, CT-2789VYD* |
| R362 | ERJ6ENF5100V | RES,M 510-F-1/10W *CT-2088YD, CT-2089VYD* |
| R362 | ERJ6ENF6200V | RES,M 620-F-1/10W *CT-1388YD, CT-1389VYD* |
| R363 | ERJ6GEYJ101V | RES,M 100-J-1/10W |
| R364 | ERJ6GEYJ101V | RES,M 100-J-1/10W |
| R365 | ERJ6GEYJ101V | RES,M 100-J-1/10W |
| R369 | ERG2FJ123H | RES,M 12K-J-2W *CT-1388YD, CT-1389VYD* |
| R374 | ERDS1TJ272T | RES,C 2.7K-J-1/2W *CT-1388YD, CT-1389VYD* |
| R375 | ERDS1TJ272T | RES,C 2.7K-J-1/2W *CT-1388YD, CT-1389VYD* |
| R376 | ERDS1TJ272T | RES,C 2.7K-J-1/2W *CT-1388YD CT-1389VYD* |
| R377 | ERJ6GEYJ471V | RES,M 470-J-1/10W *CT-1388YD CT-1389VYD, CT-2088YD CT-2089VYD, CT-2789VYD* |
| R378 | ERJ6GEYJ471V | RES,M 470-J-1/10W *CT-1388YD CT-1389VYD, CT-2088YD CT-2089VYD, CT-2789VYD* |
| R379 | ERJ6GEYJ471V | RES,M 470-J-1/10W *CT-1388YD CT-1389VYD, CT-2088YD CT-2089VYD, CT-2789VYD* |
| R380 | ERJ6GEYJ102V | RES,M 1K-J-1/10W *CT-1388YD CT-1389VYD, CT-2088YD CT-2089VYD, CT-2789VYD* |
| R381 | ERJ6GEYJ101V | RES,M 100-J-1/10W |
| R382 | ERJ6GEYJ101V | RES,M 100-J-1/10W |
| R383 | ERJ6GEYJ101V | RES,M 100-J-1/10W |
| R384 | ERJ6ENF2701V | RES,M 2.7K-F-1/10W |
| R385 | ERJ6ENF4421V | RES,M 4.42K-F-1/10W |
| R386 | ERJ6ENF1201V | RES,M 1.2K-F-1/10W |
| R387 | ERJ6ENF2701V | RES,M 2.7K-F-1/10W |
| R388 | ERJ6ENF4421V | RES,M 4.42K-F-1/10W |
| R389 | ERJ6ENF1201V | RES,M 1.2K-F-1/10W |
| R390 | ERJ6ENF2701V | RES,M 2.7K-F-1/10W |
| R391 | ERJ6ENF4421V | RES,M 4.42K-F-1/10W |
| R392 | ERJ6ENF1201V | RES,M 1.2K-F-1/10W |
| R450 | ERJ6GEYJ563V | RES,M 56K-J-1/10W *CT-2088YD, CT-2089VYD* |
| R451 | ERDS1FJ1R0P | RES,C 1.0-J-1/2W *CT-2788YD, CT-2789VYD* |
| R451 | ERDS1FJ1R2P | RES,C 1.2-J-1/2W *CT-2088YD, CT-2089VYD* |
| R451 | ERDS1FJ1R8P | RES,C 1.8-J-1/2W *CT-1388YD, CT-1389VYD* |
| R454 | ERJ6GEYJ473V | RES,M 47K-J-1/10W |
| R455 | ERJ6GEYJ153V | RES,M 15K-J-1/10W *CT-1388YD, CT-1389VYD CT-2088YD, CT-2089VYD* |

# REPLACEMENT PARTS LIST

## Models: CT-1388YD, CT-1389VYD, CT-2088YD, CT-2089VYD, CT-2788YD & CT-2789VYD

**Important Safety Notice**: Components printed in **BOLD TYPE** have special characteristics important for safety. When replacing any of these components use only manufacturer's specified parts.

| REF NO. | PART NO. | DESCRIPTION |
|---|---|---|
| R455 | ERJ6GEYJ183V | RES,M 18K-J-1/10W<br>*CT-2788YD, CT-2789VYD* |
| R456 | ERJ6GEYJ223V | RES,M 22K-J-1/10W<br>*CT-2788YD, CT-2789VYD* |
| R456 | ERJ6GEYJ472V | RES,M 4.7K-J-1/10W<br>*CT-2088YD, CT-2089VYD* |
| R456 | ERJ6GEYJ682V | RES,M 6.8K-J-1/10W<br>*CT-1388YD, CT-1389VYD* |
| R457 | ERJ6GEYJ152V | RES,M 1.5K-J-1/10W<br>*CT-2088YD, CT-2089VYD* |
| R457 | ERJ6GEYJ182V | RES,M 1.8K-J-1/10W<br>*CT-1388YD, CT-1389VYD*<br>*CT-2788YD, CT-2789VYD* |
| R458 | ERJ6GEYJ223V | RES,M 22K-J-1/10W<br>*CT-1388YD, CT-1389VYD* |
| R458 | ERJ6GEYJ333V | RES,M 33K-J-1/10W<br>*CT-2088YD, CT-2089VYD*<br>*CT-2788YD, CT-2789VYD* |
| R459 | ERJ6GEYJ683V | RES,M 68K-J-1/10W |
| R460 | ERDS2TJ102T | RES,C 1K-J-1/4W |
| R461 | ERDS2TJ152T | RES,C 1.5K-J-1/4W<br>*CT-1388YD, CT-1389VYD* |
| R462 | ERJ6GEYJ473V | RES,M 47K-J-1/10W |
| R463 | ERJ6GEYJ473V | RES,M 47K-J-1/10W |
| R465 | ERJ6GEYJ183V | RES,M 18K-J-1/10W<br>*CT-1388YD, CT-1389VYD*<br>*CT-2788YD, CT-2789VYD* |
| R465 | ERJ6GEYJ303V | RES,M 30K-J-1/10W<br>*CT-2088YD, CT-2089VYD* |
| R466 | ERJ6GEYJ683V | RES,M 68K-J-1/10W<br>*CT-1388YD, CT-1389VYD*<br>*CT-2788YD, CT-2789VYD* |
| R467 | ERJ6GEYJ104V | RES,M 100K-J-1/10W<br>*CT-1388YD, CT-1389VYD*<br>*CT-2788YD, CT-2789VYD* |
| R467 | ERJ6GEYJ183V | RES,M 18K-J-1/10W<br>*CT-2088YD, CT-2089VYD* |
| R468 | ERJ6GEYJ103V | RES,M 10K-J-1/10W |
| R469 | ERJ6GEYJ100V | RES,M 10-J-1/10W<br>*CT-1388YD, CT-1389VYD* |
| R469 | ERJ6GEYJ220V | RES,M 22-J-1/10W<br>*CT-2088YD, CT-2089VYD*<br>*CT-2788YD, CT-2789VYD* |
| R470 | ERDS2TJ152T | RES,C 1.5K-J-1/4W<br>*CT-1388YD, CT-1389VYD*<br>*CT-2088YD, CT-2089VYD* |
| R471 | ERJ6GEYJ223V | RES,M 22K-J-1/10W |
| R472 | ERJ6GEYJ473V | RES,M 47K-J-1/10W |
| R475 | ERJ6GEYJ471V | RES,M 470-J-1/10W |
| R502 | ERJ6GEYJ562V | RES,M 5.6K-J-1/10W |
| R504 | ERDS2TJ152T | RES,C 1.5K-J-1/4W<br>*CT-1388YD, CT-1389VYD*<br>*CT-2088YD, CT-2089VYD* |
| R504 | ERDS2TJ681T | RES,C 680-J-1/4W<br>*CT-2788YD, CT-2789VYD* |
| R505 | ERJ6GEYJ222V | RES,M 2.2K-J-1/10W |
| R506 | ERJ6GEYJ333V | RES,M 33K-J-1/10W |
| R507 | ERJ6GEYJ103V | RES,M 10K-J-1/10W |
| R508 | ERJ6GEYJ103V | RES,M 10K-J-1/10W |
| **R510** | **ERG3FJ182** | **RES,M 1.8K-J-3W**<br>***CT-2088YD, CT-2089VYD***<br>***CT-2788YD, CT-2789VYD*** |
| **R510** | **ERG3FJ332** | **RES,M 3.3K-J-2W**<br>***CT-1388YD, CT-1389VYD*** |
| **R511** | **ERG3FJ182** | **RES,M 1.8K-J-3W**<br>***CT-2788YD, CT-2789VYD*** |
| R512 | ERG2FJ392H | RES,M 3.9K-J-2W<br>*CT-2788YD, CT-2789VYD* |
| R512 | ERG2FJ562H | RES,M 5.6K-J-2W<br>*CT-1388YD, CT-1389VYD*<br>*CT-2088YD, CT-2089VYD* |
| R520 | ERJ6GEYJ331V | RES,M 330-J-1/10W<br>*CT-2788YD, CT-2789VYD* |
| R520 | ERJ6GEYJ471V | RES,M 470-J-1/10W<br>*CT-1388YD, CT-1389VYD*<br>*CT-2088YD, CT-2089VYD* |
| R521 | ERJ6GEYJ102V | RES,M 1K-J-1/10W<br>*CT-2788YD, CT-2789VYD* |
| R521 | ERJ6GEYJ272V | RES,M 2.7K-J-1/10W<br>*CT-1388YD, CT-1389VYD*<br>*CT-2088YD, CT-2089VYD* |
| **R531** | **ERD25FJ470P** | **RES,C 47-J-1/4W** |
| **R532** | **ERJ6ENF1002V** | **RES,M 10K-F-1/10W**<br>***CT-1388YD, CT-1389VYD***<br>***CT-2788YD, CT-2789VYD*** |
| **R532** | **ERJ6ENF1372V** | **RES,M 13.7K-F-1/10W**<br>***CT-2088YD, CT-2089VYD*** |
| **R533** | **ERJ6ENF1691V** | **RES,M 1.69K-F-1/10W**<br>***CT-1388YD, CT-1389VYD*** |
| **R533** | **ERJ6ENF1781V** | **RES,M 1.78K-F-1/10W**<br>***CT-2788YD, CT-2789VYD*** |
| **R533** | **ERJ6ENF1821V** | **RES,M 1.82K-F-1/10W**<br>***CT-2088YD, CT-2089VYD*** |
| **R551** | **ERDS1FJ1R0T** | **RES,C 1.0-J-1/2W** |
| **R552** | **ERDS1FJ1R0T** | **RES,C 1.0-J-1/2W** |
| **R555** | **ERDS1FJ101T** | **RES,C 100-J-1/2W**<br>***CT-1388YD, CT-1389VYD***<br>***CT-2088YD, CT-2089VYD*** |
| R556 | ERG1SJ221P | RES,M 220-J-1W |
| R557 | ERJ6GEYJ103V | RES,M 10K-J-1/10W |
| **R558** | **ERQ1CJP1R5S** | **RES,F 1.5-J-1W**<br>***CT-1388YD, CT-1389VYD*** |
| **R558** | **ERQ1CKPR56S** | **RES,F .56-K-1W**<br>***CT-2788YD, CT-2789VYD*** |
| **R558** | **ERQ2CJP2R7S** | **RES,F 2.7-J-2W**<br>***CT-2088YD, CT-2089VYD*** |
| R559 | ERG2FJ683H | RES,M 12K-J-2W *CT-1389VYD*<br>*CT-2089VYD, CT-2789VYD* |
| R560 | ERDS1FJ182P | RES,C 1.8K-J-1/2W<br>*CT-1388YD, CT-1389VYD* |
| R561 | ERG2FJ102H | RES,M 1K-J-2W<br>*CT-2788YD, CT-2789VYD* |
| R562 | ERG3FJ680H | RES,M 68-J-3W<br>*CT-1389VYD*<br>*CT-2089VYD, CT-2789VYD* |

# REPLACEMENT PARTS LIST

## Models: CT-1388YD, CT-1389VYD, CT-2088YD, CT-2089VYD, CT-2788YD & CT-2789VYD

**Important Safety Notice**: Components printed in **BOLD TYPE** have special characteristics important for safety. When replacing any of these components use only manufacturer's specified parts.

| REF NO. | PART NO. | DESCRIPTION |
|---|---|---|
| R563 | ERG1SJ150P | RES,M 15-J-1W |
| R567 | ERG2FJ122H | RES,M 12K-J-2W<br>*CT-2088YD, CT-2089VYD* |
| R567 | ERG2FJ471H | RES,M 470-J-2W<br>*CT-1388YD, CT-1389VYD* |
| R572 | ERJ6GEYJ152V | RES,M 1.5K-J-1/10W<br>*CT-2788YD, CT-2789VYD* |
| R572 | ERJ6GEYJ222V | RES,M 2.2K-J-1/10W<br>*CT-2088YD, CT-2089VYD* |
| R572 | ERJ6GEYJ392V | RES,M 3.9K-J-1/10W<br>*CT-1388YD, CT-1389VYD* |
| R605 | ERDS2TJ103T | RES,C 10K-J-1/4W |
| R606 | ERJ6GEYJ562V | RES,M 5.6K-J-1/10W |
| R607 | ERJ6GEYJ102V | RES,M 1K-J-1/10W |
| R608 | ERJ6GEYJ104V | RES,M 100K-J-1/10W |
| **R801** | **ERF7ZK1R5** | **RES,W 1.5-K-7W** |
| R802 | ERDS2TJ684T | RES,C 680K-J-1/4W |
| R803 | ERG2FJ100H | RES,M 10K-J-1/2W |
| R804 | ERG2FJ104H | RES,M 100K-J-2W |
| **R805** | **ERX2FJR27H** | **RES,C .27-J-2W**<br>***CT-1388YD, CT-1389VYD*** |
| **R805** | **ERX2FZJR18H** | **RES,M 18-J-2W**<br>***CT-2088YD,CT-2089VYD***<br>***CT-2788YD, CT-2789VYD*** |
| **R806** | **ERX2FJR56H** | **RES,M .56-J-2W**<br>***CT-2088YD,CT-2089VYD***<br>***CT-2788YD, CT-2789VYD*** |
| R807 | ERDS2TJ681T | RES,C 680-J-1/4W |
| R808 | ERDS2TJ4R7T | RES,C 4.7-J-1/4W |
| R809 | ERDS2TJ472T | RES,C 4.7K-J-1/4 |
| **R815** | **ERC12ZGM825D** | **RES,S 8.2MEG-M-1/2** |
| **R817** | **ERX3FJ4R7** | **RES,M 4.7-J-3W**<br>***CT-1388YD, CT-1389VYD*** |
| **R817** | **ERX3FJ6R8** | **RES,M 6.8-J-3W**<br>***CT-2088YD, CT-2089VYD*** |
| R821 | ERDS1FJ1R0T | RES,C 1.0-J-1/2W<br>*CT-1388YD,CT-1389VYD*<br>*CT-2788YD, CT-2789VYD* |
| R821 | ERDS1FJ1R5T | RES,C 1.5-J-1/2W<br>*CT-2088YD, CT-2089VYD* |
| R822 | ERDS1FJ1R0T | RES,C 1.0-J-1/2W<br>*CT-2788YD, CT-2789VYD* |
| R822 | ERDS1FJ1R5T | RES,C 1.5-J-1/2W<br>*CT-2088YD, CT-2089VYD* |
| R823 | ERDS1FJ272T | RES,C 2.7K-J-1/2W |
| R824 | ERDS2TJ223T | RES,C 22K-J-1/4W |
| R825 | ERDS2TJ272T | RES,C 2.7K-J-1/4W |
| R828 | ERJ6GEYJ104V | RES,M 100K-J-1/10W |
| R830 | ERDS2TJ104T | RES,C 100K-J-1/4W |
| R831 | ERDS2TJ682T | RES,C 6.8K-J-1/4W |
| **R850** | **ERQ12HJR56P** | **RES,F .56-J-1/2W** |
| R1002 | ERJ6GEYJ101V | RES,M 100-J-1/10W<br>*CT-2788YD, CT-2789VYD* |
| R1003 | ERJ6GEYJ101V | RES,M 100-J-1/10W<br>*CT-2788YD, CT-2789VYD* |
| R1008 | ERJ6GEYJ102V | RES,M 1K-J-1/10W<br>*CT-1388YD, CT-1389VYD*<br>*CT-2088YD, CT-2089VYD* |
| R2201 | ERJ6GEYJ224V | RES,M 220K-J-1/10W<br>*CT-2789VYD* |
| R2203 | ERJ6GEYJ102V | RES,M 1K-J-1/10W<br>*CT-2789VYD* |
| R2204 | ERJ6GEYJ102V | RES,M 1K-J-1/10W<br>*CT-2789VYD* |
| R2205 | ERJ6GEYJ101V | RES,M 100-J-1/10W<br>*CT-2789VYD* |
| R2206 | ERJ6GEYJ273V | RES,M 27K-J-1/10W<br>*CT-2789VYD* |
| R2301 | ERQ2CJP3R9S | RES,F 3.9-J-2W |
| R2307 | ERJ6GEYJ103V | RES,M 10K-J-1/10W |
| R2336 | ERJ6GEYJ105V | RES,M 1M-J-1/10W<br>*CT-2788YD, CT-2789VYD* |
| R2337 | ERJ6GEYJ101V | RES,M 100-J-1/10W<br>*CT-2788YD, CT-2789VYD* |
| R2338 | ERJ6GEYJ101V | RES,M 100-J-1/10W<br>*CT-2788YD, CT-2789VYD* |
| R2339 | ERJ6GEYJ105V | RES,M 1M-J-1/10W<br>*CT-2788YD, CT-2789VYD* |
| R2350 | ERDS2TJ102T | RES,C 1K-J-1/4W<br>*CT-1388YD, CT-1389VYD,*<br>*CT-2088YD, CT-2089VYD* |
| R2350 | ERDS2TJ391T | RES,C 390-J-1/4W<br>*CT-2788YD, CT-2789VYD* |
| R2351 | ERJ6GEYJ273V | RES,M 27K-J-1/10W<br>*CT-1388YD, CT-1389VYD,*<br>*CT-2088YD, CT-2089VYD* |
| R2351 | ERJ6GEYJ562V | RES,M 5.6K-J-1/10W<br>*CT-2788YD, CT-2789VYD* |
| R2352 | ERJ6GEYJ683V | RES,M 68K-J-1/10W<br>*CT-2788YD, CT-2789VYD* |
| R2353 | ERJ6GEYJ124V | RES,M 120K-J-1/10W<br>*CT-2788YD, CT-2789VYD* |
| R2354 | ERJ6GEYJ123V | RES,M 12K-J-1/10W |
| R2355 | ERJ6GEYJ222V | RES,M 2.2K-J-1/10W<br>*CT-2788YD, CT-2789VYD* |
| R2355 | ERJ6GEYJ392V | RES,M 3.9K-J-1/10W<br>*CT-1388YD, CT-1389VYD*<br>*CT-2088YD, CT-2089VYD* |
| R2356 | ERJ6GEYJ101V | RES,M 100-J-1/10W |
| R2357 | ERJ6GEYJ472V | RES,M 4.7K-J-1/10W |
| R2365 | ERDS2TJ102T | RES,C 1K-J-1/4W |
| R2370 | ERJ6GEYJ103V | RES,M 10K-J-1/10W |
| R3001 | ERDS2TJ101T | RES,C 100-J-1/4W |
| R3023 | ERJ6GEYJ183V | RES,M 18K-J-1/10W<br>*CT-1388YD,CT-1389VYD*<br>*CT-2088YD, CT-2089VYD* |
| R3024 | ERJ6GEYJ473V | RES,M 47K-J-1/10W<br>*CT-1388YD,CT-1389VYD*<br>*CT-2088YD, CT-2089VYD* |
| R3026 | ERJ6GEYJ472V | RES,M 4.7K-J-1/10W<br>*CT-2789VYD* |

# REPLACEMENT PARTS LIST

## Models: CT-1388YD, CT-1389VYD, CT-2088YD, CT-2089VYD, CT-2788YD & CT-2789VYD

**Important Safety Notice**: Components printed in **BOLD TYPE** have special characteristics important for safety. When replacing any of these components use only manufacturer's specified parts.

| REF NO. | PART NO. | DESCRIPTION |
|---|---|---|
| R3028 | ERJ6GEYJ823V | RES,M 82K-J-1/10W *CT-2789VYD* |
| R3029 | ERJ6GEYJ102V | RES,M 1K-J-1/10W *CT-2789VYD* |
| R3031 | ERJ6GEYJ303V | RES,M 30K-J-1/10W *CT-2789VYD* |
| R3032 | ERJ6GEYJ102V | RES,M 1K-J-1/10W *CT-1388YD CT-1389VYD, CT-2088YD CT-2089VYD, CT-2789VYD* |
| R3037 | ERJ6GEYJ221V | RES,M 220-J-1/10W *CT-1388YD CT-1389VYD, CT-2088YD CT-2089VYD, CT-2789VYD* |
| R3038 | ERJ6GEYJ471V | RES,M 470-J-1/10W *CT-1388YD CT-1389VYD, CT-2088YD CT-2089VYD, CT-2789VYD* |
| R3039 | ERJ6GEYJ471V | RES,M 470-J-1/10W *CT-1388YD CT-1389VYD, CT-2088YD CT-2089VYD, CT-2789VYD* |
| R3040 | ERJ6GEYJ473V | RES,M 47K-J-1/10W *CT-1388YD CT-1389VYD, CT-2088YD CT-2089VYD, CT-2789VYD* |
| R3041 | ERJ6GEYJ750V | RES,M 75-J-1/10W *CT-1388YD CT-1389VYD, CT-2088YD CT-2089VYD, CT-2789VYD* |
| R3043 | ERJ6GEYJ102V | RES,M 1K-J-1/10W *CT-2789VYD* |
| R3049 | ERJ6GEYJ221V | RES,M 220-J-1/10W *CT-1388YD CT-1389VYD, CT-2088YD CT-2089VYD, CT-2789VYD* |
| R3050 | ERJ6GEYJ101V | RES,M 100-J-1/10W |
| R3051 | ERJ6GEYJ101V | RES,M 100-J-1/10W |
| R3052 | ERJ6GEYJ303V | RES,M 30K-J-1/10W *CT-1388YD CT-1389VYD, CT-2088YD CT-2089VYD, CT-2789VYD* |
| R3053 | ERJ6GEYJ472V | RES,M 4.7K-J-1/10W *CT-1388YD CT-1389VYD, CT-2088YD CT-2089VYD, CT-2789VYD* |
| R3070 | ERJ6GEYJ390V | RES,M 39-J-1/10W |
| R3071 | ERJ6GEYJ390V | RES,M 39-J-1/10W *CT-1388YD, CT-1389VYD, CT-2088YD, CT-2089VYD* |
| R3072 | ERJ6GEYJ390V | RES,M 39-J-1/10W *CT-1388YD, CT-1389VYD, CT-2088YD, CT-2089VYD* |
| R3073 | ERJ6GEYJ102V | RES,M 1K-J-1/10W *CT-1388YD CT-1389VYD, CT-2088YD CT-2089VYD, CT-2789VYD* |
| R3074 | ERJ6GEYJ562V | RES,M 5.6K-J-1/10W *CT-2789VYD* |
| R3076 | ERJ6GEYJ223V | RES,M 22K-J-1/10W *CT-2788YD, CT-2789VYD* |
| R3078 | ERJ6GEYJ183V | RES,M 18K-J-1/10W *CT-1388YD, CT-1389VYD, CT-2088YD, CT-2089VYD* |
| R3078 | ERJ6GEYJ223V | RES,M 22K-J-1/10W *CT-2788YD, CT-2789VYD* |
| R3079 | ERJ6GEYJ473V | RES,M 47K-J-1/10W *CT-1388YD, CT-1389VYD, CT-2088YD, CT-2089VYD* |
| R3085 | ERJ6GEYJ102V | RES,M 1K-J-1/10W *CT-1388YD CT-1389VYD, CT-2088YD CT-2089VYD, CT-2789VYD* |
| R3086 | ERJ6GEYJ102V | RES,M 1K-J-1/10W *CT-2789VYD* |
| R3090 | ERD25TJ750T | RES,C 75-J-1/4W |
| R3090 | ERJ6GEYJ103V | RES,M 10K-J-1/10W *CT-1388YD, CT-1389VYD, CT-2088YD, CT-2089VYD* |
| R3091 | ERD25TJ750T | RES,C 75-J-1/4W *CT-1388YD, CT-1389VYD, CT-2088YD, CT-2089VYD* |
| R3091 | ERJ6GEYJ103V | RES,M 10K-J-1/10W *CT-1388YD, CT-1389VYD, CT-2088YD, CT-2089VYD* |
| R3092 | ERD25TJ750T | RES,C 75-J-1/4W *CT-1388YD, CT-1389VYD, CT-2088YD, CT-2089VYD* |
| R3200 | ERJ6GEYJ562V | RES,M 5.6K-J-1/10W *CT-2789VYD* |
| R3201 | ERD25TJ750S | RES,C 75-J-1/4W |
| R3202 | ERD25TJ750T | RES,C 75-J-1/4W |
| R3202 | ERJ6GEYJ183V | RES,M 18K-J-1/10W *CT-1388YD, CT-1389VYD, CT-2088YD, CT-2089VYD* |
| R3203 | ERJ6GEYJ473V | RES,M 47K-J-1/10W *CT-1388YD, CT-1389VYD, CT-2088YD, CT-2089VYD* |
| R3204 | ERJ6GEYJ682V | RES,M 6.8K-J-1/10W *CT-2788YD, CT-2789VYD* |
| R3205 | ERJ6GEYJ682V | RES,M 6.8K-J-1/10W *CT-2788YD, CT-2789VYD* |
| R3207 | ERJ6GEYJ823V | RES,M 82K-J-1/10W *CT-1388YD CT-1389VYD, CT-2088YD CT-2089VYD, CT-2789VYD* |
| | | ***SWITCHES*** |
| S001 | EVQPF106K | SWITCH |
| S002 | EVQPF106K | SWITCH |
| S003 | EVQPF106K | SWITCH |
| S004 | EVQPF106K | SWITCH |
| S005 | EVQPF106K | SWITCH |
| S008 | EVQPF106K | SWITCH |
| S009 | EVQPF106K | SWITCH *CT-1388YD CT-1389VYD, CT-2088YD CT-2089VYD, CT-2789VYD* |
| | | ***TRANSFORMERS*** |
| **T501** | **TLH15452** | **TRANSFORMER, HORIZONTAL DRIVE** |
| **T551** | **KFT2AB118F** | **TRANSFORMER, FLYBACK *CT-1388YD, CT-1389VYD*** |
| **T551** | **KFT3AA341F** | **TRANSFORMER, FLYBACK *CT-2088YD, CT-2089VYD*** |
| **T551** | **KFT4AA348F** | **TRANSFORMER, FLYBACK *CT-2788YD, CT-2789VYD*** |

# REPLACEMENT PARTS LIST

## Models: CT-1388YD, CT-1389VYD, CT-2088YD, CT-2089VYD, CT-2788YD & CT-2789VYD

**Important Safety Notice**: Components printed in **BOLD TYPE** have special characteristics important for safety. When replacing any of these components use only manufacturer's specified parts.

| REF NO. | PART NO. | DESCRIPTION |
|---|---|---|
| **T801** | **ETS29AS183NC** | **TRANSFORMER** ***CT-1388YD, CT-1389VYD, CT-2088YD, CT-2089VYD*** |
| **T801** | **ETS35AA5G3NC** | **TRANSFORMER** ***CT-2788YD, CT-2789VYD*** |
| | | ***CRYSTALS/FILTERS*** |
| X001 | TSSA092 | CRYSTAL OSCILLATOR |
| X002 | AF080005BE | CRYSTAL OSCILLATOR |
| | | ***OTHERS*** |
| **TNR001** | **ENG36604G** | **TUNER** ***CT-1389VYD CT-2089VYD, CT-2789VYD*** |
| **M001** | **TSX2AA0151-1** | **A/C LINE CORD** |
| **M002** | **37GDA85X(M)** | **CRT 13"** ***CT-1388YD, CT-1389VYD*** |
| **M003** | **A51KQN011X** | **CRT 20"** ***CT-2088YD, CT-2089VYD*** |
| **M004** | **M68LGL061X** | **CRT 27"** ***CT-2788YD, CT-2789VYD*** |
| **M005** | **TJSC00200** | **SOCKET, CRT** ***CT-1388YD, CT-1389VYD*** |
| **M006** | **TJSC00300** | **CRT SOCKET** ***CT-2088YD, CT-2089VYD CT-2788YD, CT-2789VYD*** |
| **DY** | **TLY2AA006** | **DEFLECTION YOKE** ***CT-2788YD, CT-2789VYD*** |
| **DY** | **TLY2AA010** | **DEFLECTION YOKE** ***CT-2088YD, CT-2089VYD*** |
| **DY** | **0LY15311F** | **YOKE, DEFLECTION** ***CT-1388YD, CT-1389VYD*** |
| M007 | JH225U-012 | YOKE, CONVERGENCE *CT-1388YD, CT-1389VYD* |
| M008 | JH291U-009 | YOKE, CONVERGENCE *CT-2788YD, CT-2789VYD* |
| M009 | TXF3A01TLR2 | ASSY., DAG GND *CT-1388YD, CT-1389VYD* |
| M010 | TXF3A01ZERA | ASSY., DAG GND *CT-2788YD, CT-2789VYD* |
| M011 | TXF3A011DB2 | ASSY. DAG GROUND *CT-2088YD, CT-2089VYD* |
| **DEG** | **TLK2AA0011** | **COIL, DEGAUSSING 27"** ***CT-2788YD, CT-2789VYD*** |
| **DEG** | **TSP2AA008** | **COIL, DEGAUSSING 20"** ***CT-2088YD, CT-2089VYD*** |
| **DEG** | **TSP2AA010** | **COIL, DEGAUSSING 13"** ***CT-1388YD, CT-1389VYD*** |
| M012 | TXANV03ESER | DEG. COIL INST. KIT Strap Wire Ties *CT-2088YD, CT-2089VYD* |
| M013 | TMM2A30702 | WEDGE, YOKE |
| M014 | 0FMK014ZZ | CONVERGENCE CORRECTOR STRIP |
| M015 | TXFKY42ESER | ASSY, CABINET FRONT Cab. 13", Smoke Sheet, Badge, Label Service Info *CT-1388YD* |
| M016 | TXFKY43ESER | ASSY, CABINET FRONT Cab. 13", Smoke Sheet, Badge, IR Guide, Label *CT-1389VYD* |
| M017 | TXFKY44ESER | ASSY, CABINET FRONT Cab. 20", Smoke Sheet, Badge, Label X-ray Warning (EN) *CT-2088YD* |
| M018 | TXFKY45ESER | ASSY, CABINET FRONT Cab. 20", Smoke Sheet, Badge, IR Guide, Label X-ray Warning (EN) *CT-2089VYD* |
| M019 | TXFKY46ESER | ASSY, CABINET FRONT Cab. 27", Badge, Smoke Sheet, Label Service Info, Pad Foam *CT-2788YD* |
| M020 | TXFKY47ESER | ASSY, CABINET FRONT Cab. 27", Badge, IR Guide, Smoke Sheet, Label Service Info, Pad Foam *CT-2789VYD* |
| M021 | EASG9D538S2 | SPEAKER *CT-2788YD, CT-2789VYD* |
| M022 | TAS2AA0012 | SPEAKER 16-OHM 1.5W *CT-2088YD, CT-2089VYD* |
| M023 | TAS2AA0014 | SPEAKER 16-OHM 1.5W *CT-1388YD, CT-1389VYD* |
| M024 | TBM2A10141 | BADGE, PANASONIC *CT-2088YD, CT-2089VYD CT-2788YD, CT-2789VYD* |
| M025 | TBM2A30832 | BADGE, PANASONIC *CT-1388YD, CT-1389VYD* |
| M026 | TBX2AA00601G | BUTTON, 7-KEY *CT-2088YD, CT-2089VYD* |
| M027 | TBX2AA1101G | BUTTON, 7-KEY *CT-1388YD, CT-1389VYD* |
| M028 | TBX2AA1301G | BUTTON, 7-KEY *CT-2789VYD* |
| M029 | TBX2AA1302G | BUTTON, 7-KEY *CT-2788YD* |
| M030 | TJS1A7010 | CONNECTOR EARPHONE JACK *CT-1388YD, CT-1389VYD* |
| M031 | TKP2AA00601 | SMOKED SHEET |
| M032 | TKX2A3751 | GUIDE, IR *CT-1389VYD* |
| M033 | TKX2A3753 | GUIDE, IR *CT-2089VYD* |
| M034 | TKX2A3756 | GUIDE, IR *CT-2789VYD* |
| M035 | TXFKU2897SER | ASSY, CABINET BACK Cover Cabinet Back, Felt, Label X-ray Warning (FR), Label X-ray Warning (EN), Label info, FCC Label *CT-1388YD* |
| M036 | TXFKU31ESER | ASSY, CABINET BACK Nameplate Model, Cover Cabinet Back, Felt, X-ray Warning Label (FR), FCC Label, Label Info *CT-2088YD* |
| M037 | TXFKU32ESER | ASSY, CABINET BACK Cover Cabinet Back, Nameplate Model, Felt, X-ray Warning Label (FR), FCC Label, Warning Label, Label Info *CT-2089VYD* |

# REPLACEMENT PARTS LIST

**Models: CT-1388YD, CT-1389VYD, CT-2088YD, CT-2089VYD, CT-2788YD & CT-2789VYD**

**Important Safety Notice**: Components printed in **BOLD TYPE** have special characteristics important for safety. When replacing any of these components use only manufacturer's specified parts.

| REF NO. | PART NO. | DESCRIPTION |
|---|---|---|
| M038 | TXFKU33ESER | ASSY, CABINET BACK<br>Nameplate Model, Cover Cabinet Back, Felt, Label, Caution (FR), X-ray Warning Label (FR), FCC Label, X-ray Warning Label (EN)<br>*CT-2788YD* |
| M039 | TXFKU34ESER | ASSY, CABINET BACK<br>Nameplate Model, Cover Cabinet Back, Felt, X-ray Warning Label (FR), FCC Label, Warning Label, Label info, X-ray Warning Label (EN)<br>*CT-2789VYD* |
| M040 | TXFKU59ASER | ASSY, CABINET BACK<br>Nameplate Model, Cover Cabinet Back, Felt, X-ray Warning Label (FR), FCC Label, Label Info, X-ray Warning Label (EN)<br>*CT-1389VYD* |

| REF NO. | PART NO. | DESCRIPTION |
|---|---|---|
| M041 | TJS2A9560 | CONNECTOR, S-VHS |
| M042 | TJS1A4560 | CONNECTOR, BNC WITH SWITCH |
| M043 | TJS2A48061 | CONNECTOR, BNC WITHOUT SWITCH |
| | | ***ACCESORIES*** |
| M044 | EUR501450 | REMOTE CONTROL *CT-1389VYD*<br>*CT-2089VYD, CT-2789VYD* |
| M045 | UR50EC1190A | BATTERY COVER, REMOTE CONTROL<br>*CT-1389VYD*<br>*CT-2089VYD, CT-2789VYD* |
| M046 | TQB2AA0386 | MANUAL, OWNERS |
| M047 | TQB2AA7057 | REMOTE GUIDE *CT-1389VYD*<br>*CT-2089VYD, CT-2789VYD* |
| M048 | TQB2AA7108 | V-CHIP MANUAL *CT-1389VYD*<br>*CT-2089VYD, CT-2789VYD* |

## DESCRIPTION OF ABBREVIATIONS GUIDE

| RESISTOR | | | |
|---|---|---|---|
| TYPE | | TOLERANCE | |
| C | Carbon | F | +/- 1% |
| F | Fuse | J | +/- 5% |
| M | Metal Oxide | K | +/- 10% |
| S | Solid | M | +/- 20% |
| W | Wire Wound | G | +/- 2% |

**RES, C 270-J-1/4**

| CAPACITOR | | | |
|---|---|---|---|
| TYPE | | TOLERANCE | |
| C | Ceramic | C | +/- 0.25pF |
| E | Electrolytic | D | +/- 0.5pF |
| P | Polyester | F | +/- 1pF |
| S | Styrol | J | +/- 5% |
| T | Tantalum | K | +/- 10% |
| | | L | +/- 15% |
| | | M | +/- 20% |
| | | P | +10% -0% |
| | | Z | +80% -20% |

**CAP, P .068UF-K-50V**

# NOTES:

# SCHEMATIC NOTES:

**1. RESISTOR**

All resistors are carbon 1/4W resistor, unless otherwise noted by the following marks.
Unit of resistance is ohm (Ω), (K=1,000, M=1,000,000)

| | | | |
|---|---|---|---|
| ◯ | Non Flammable | △ | Solid |
| ☒ | Metal Oxide | ◎ | Metal (Precision and high stability) |
| □ | Wire Wound | ▬ | Thermistor |
| ⊗ | Fusible | ▭ | Positive coefficient Thermistor |
| ▨ | Flame Proof Rectangular | | |

**2. CAPACITOR**

All capacitors are ceramic 50V capacitor, unless otherwise noted by the following marks.
Unit of capacitance is μF, unless otherwise noted.

| | | | |
|---|---|---|---|
| +⊟- | Electrolytic | ☒ | Metalized Polyester |
| Ⓣ | Tantalum | ⓜ | Polyprolene |
| NP | Bipolar | △ | Mica |
| Ⓢ | Polystyrene | ◯ | Ceramic |
| ⊗ | Temperature Compensation | ◎ | Ceramic (SL) |
| Ⓜ | Polyester | | |

**3. COIL**

Unit of inductance is μH, unless otherwise noted.

**4. VOLTAGE MEASUREMENT**

Voltage is measured by a digital meter receiving normal signal.

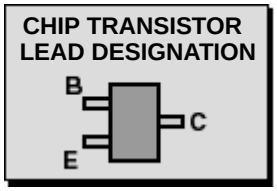
***Note:*** *These schematic diagrams are the latest at the time of printing and are subject to change without notice.*

## SERVICE NOTES:

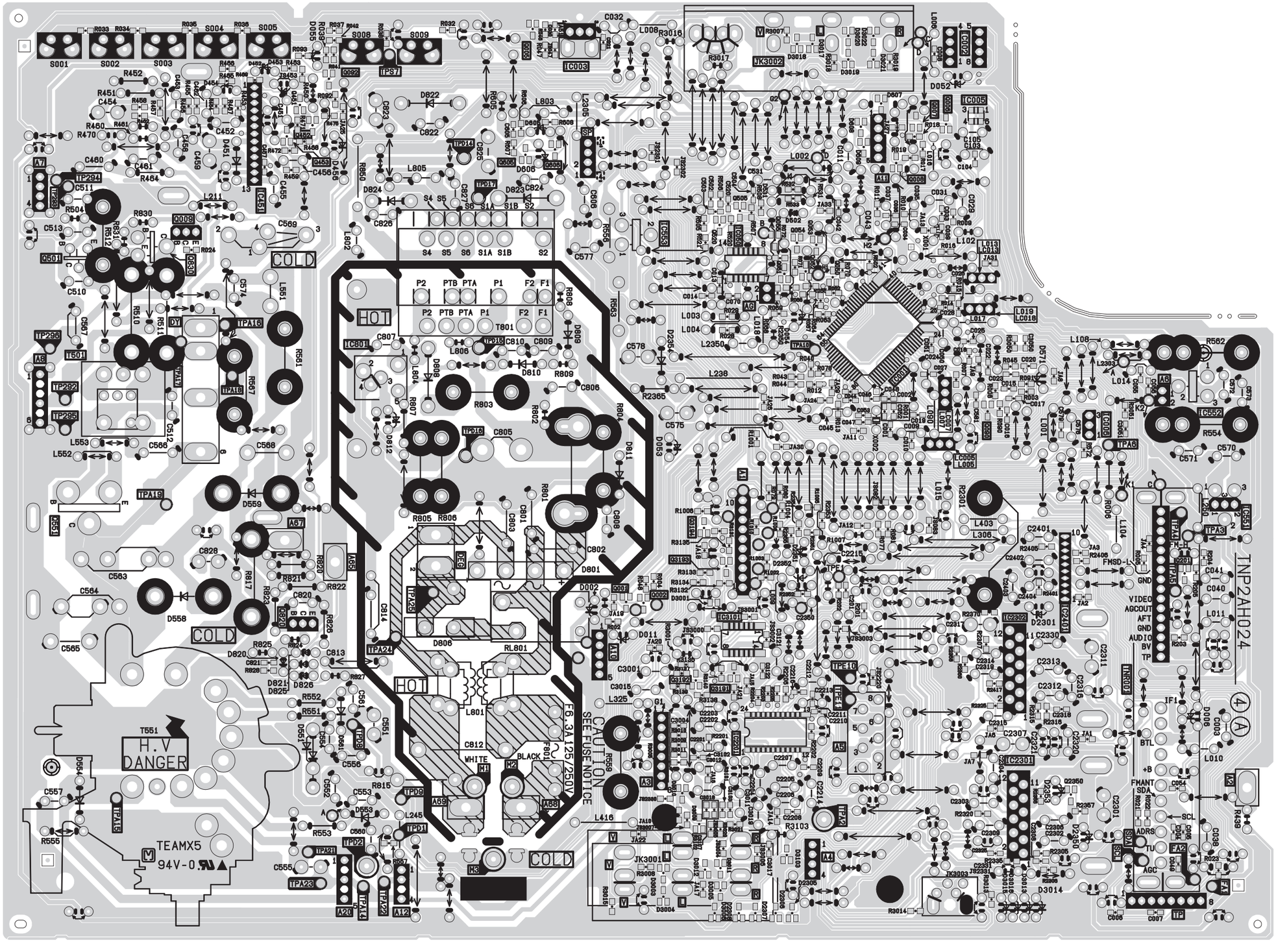
This model has section that does not share a common ground with the power supply section. The different sections are referred to as HOT section and COLD section in the precautions below.

1. Do not touch the HOT section and the COLD section at the same time. You may receive an electric shock.
2. Do not short the HOT section to the COLD section. This could blow the fuse or damage parts.
3. Never measure the HOT section and the COLD section at the same time when using tools such as oscilloscopes or multimeters.
4. Always unplug the unit before beginning any operation such as removing the chassis.

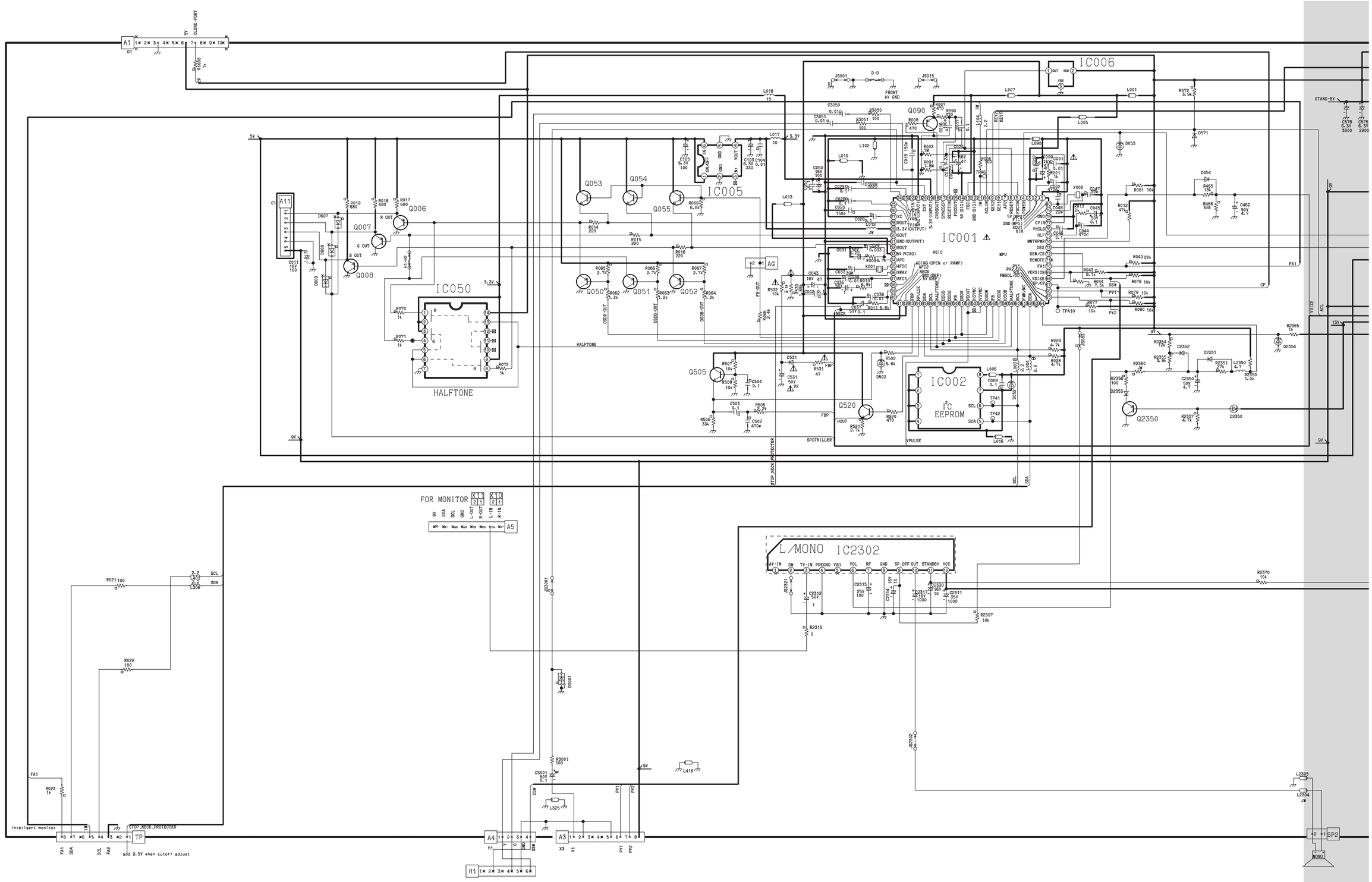
## Chip Transistor Lead Designation

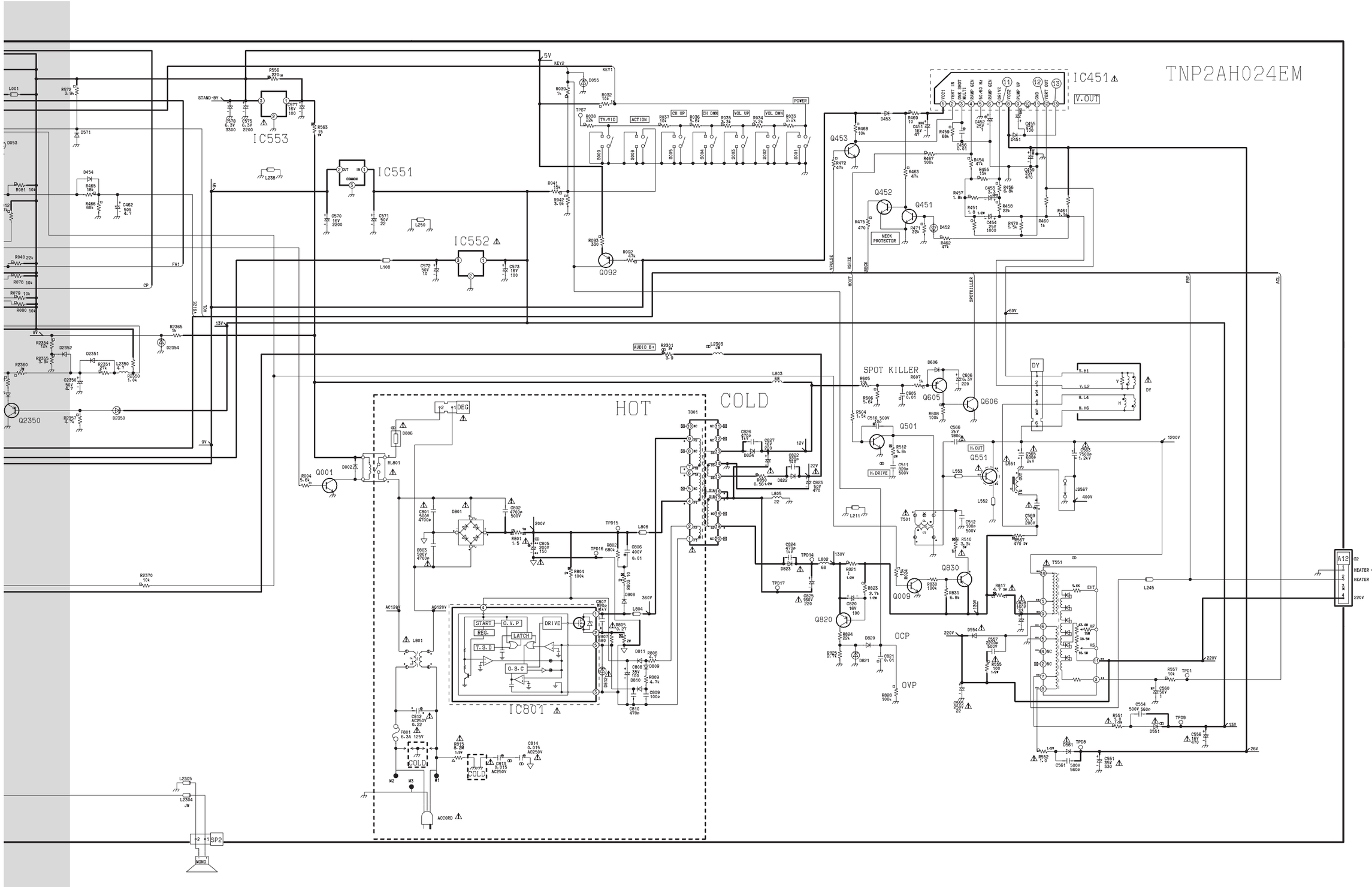


# A-Board Layout -- Diagrama Impreso Tarjeta-A

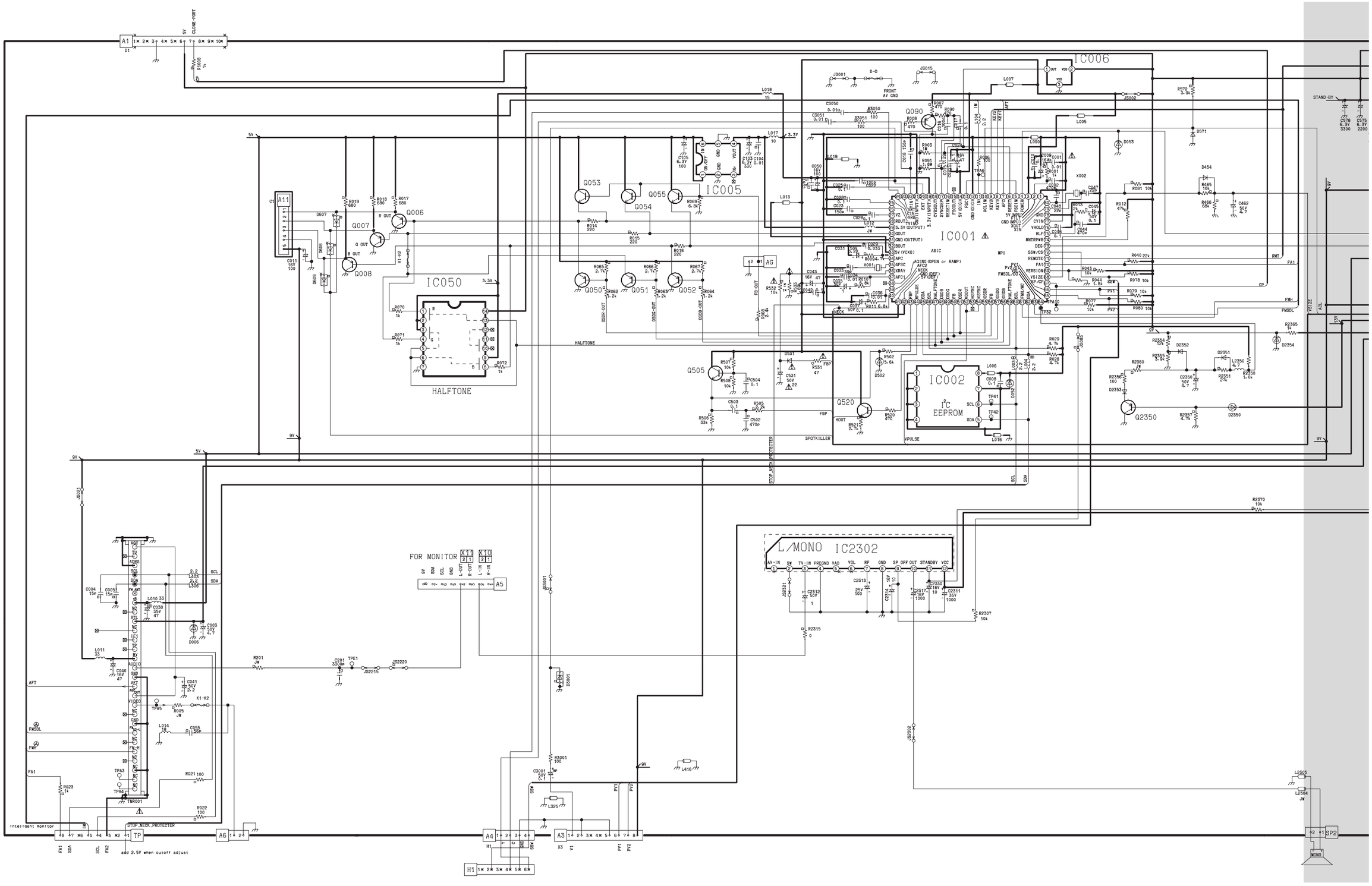


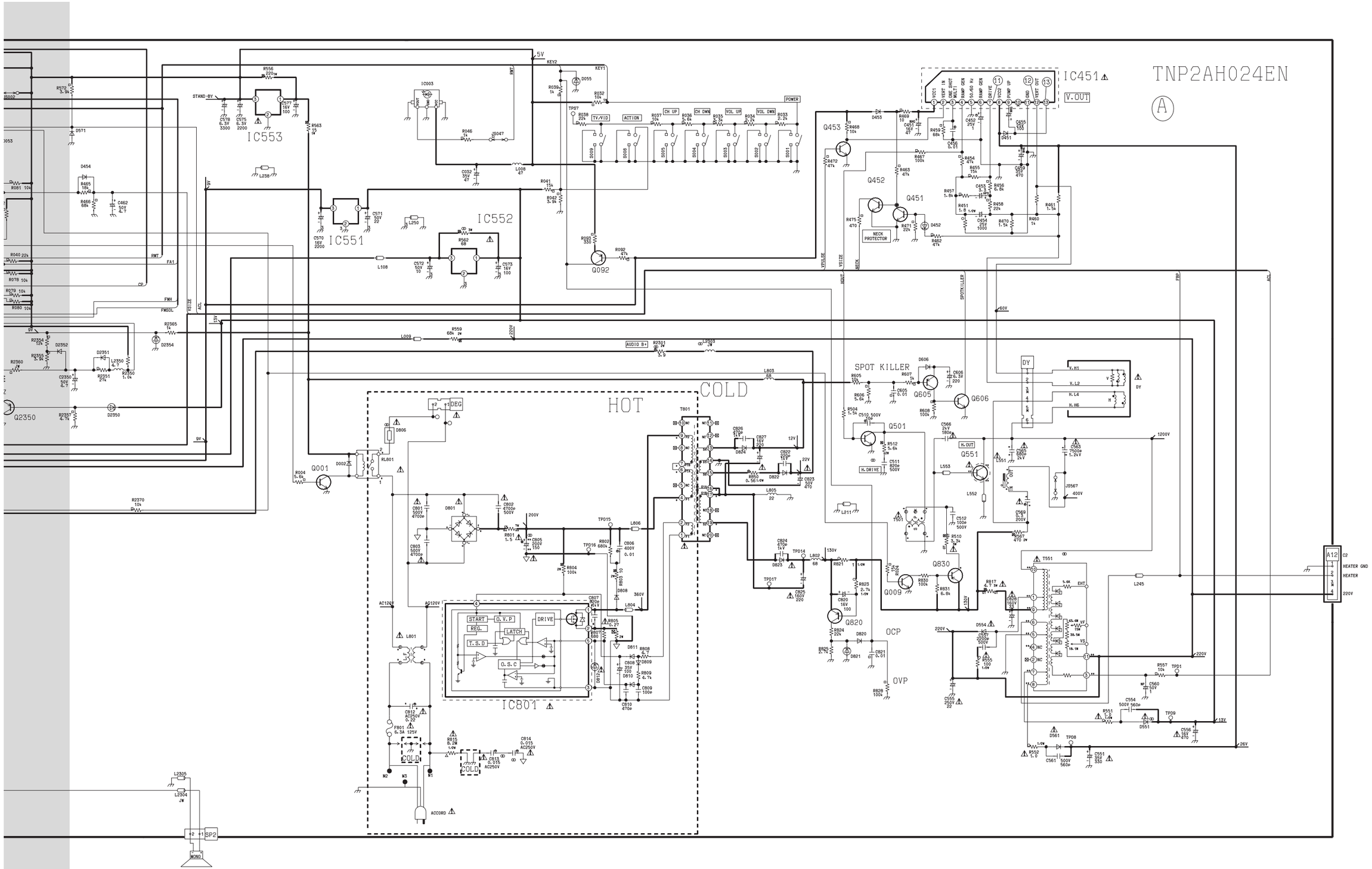
# A-Board Schematic Left Portion -- Diagrama Eléctrico Tarjeta-A Porcion Izquierda



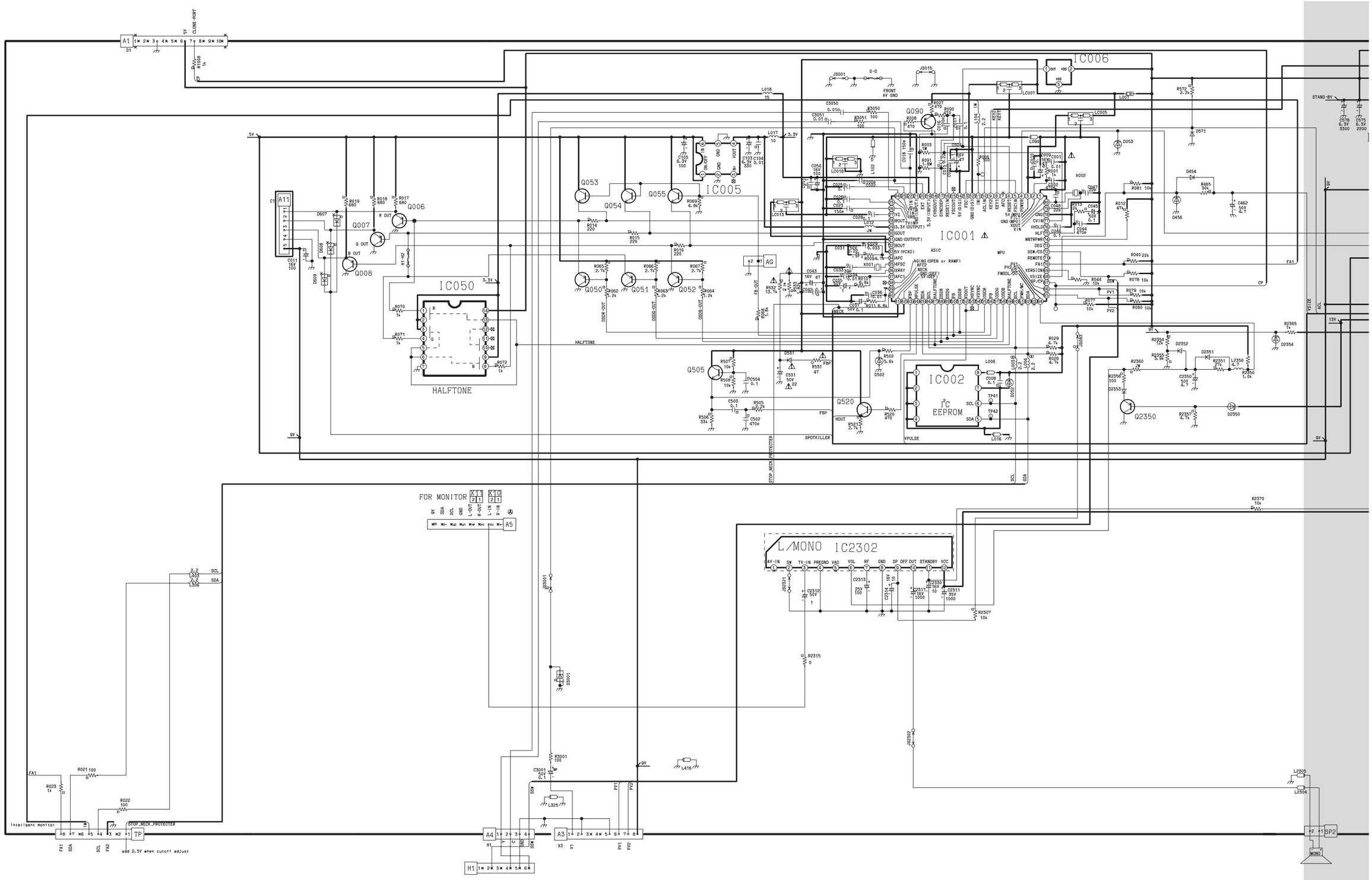

TNP2AH024EM
IC451
V.OUT
IC553
IC551
IC552
Q092
Q452
Q451
NECK PROTECTOR
SPOT KILLER
Q606
Q605
Q501
H. DRIVE
Q551
H. OUT
Q830
Q009
Q820
OCP
OVP
HOT
COLD
Q001
RL801
IC801
START
O.V.P
DRIVE
REG.
LATCH
T.S.D
O.S.C
TV/VID
ACTION
CH UP
CH DWN
VOL UP
VOL DWN
POWER
DY
EHT
HEATER GND
HEATER
220V
26V
13V
SP2
MONO

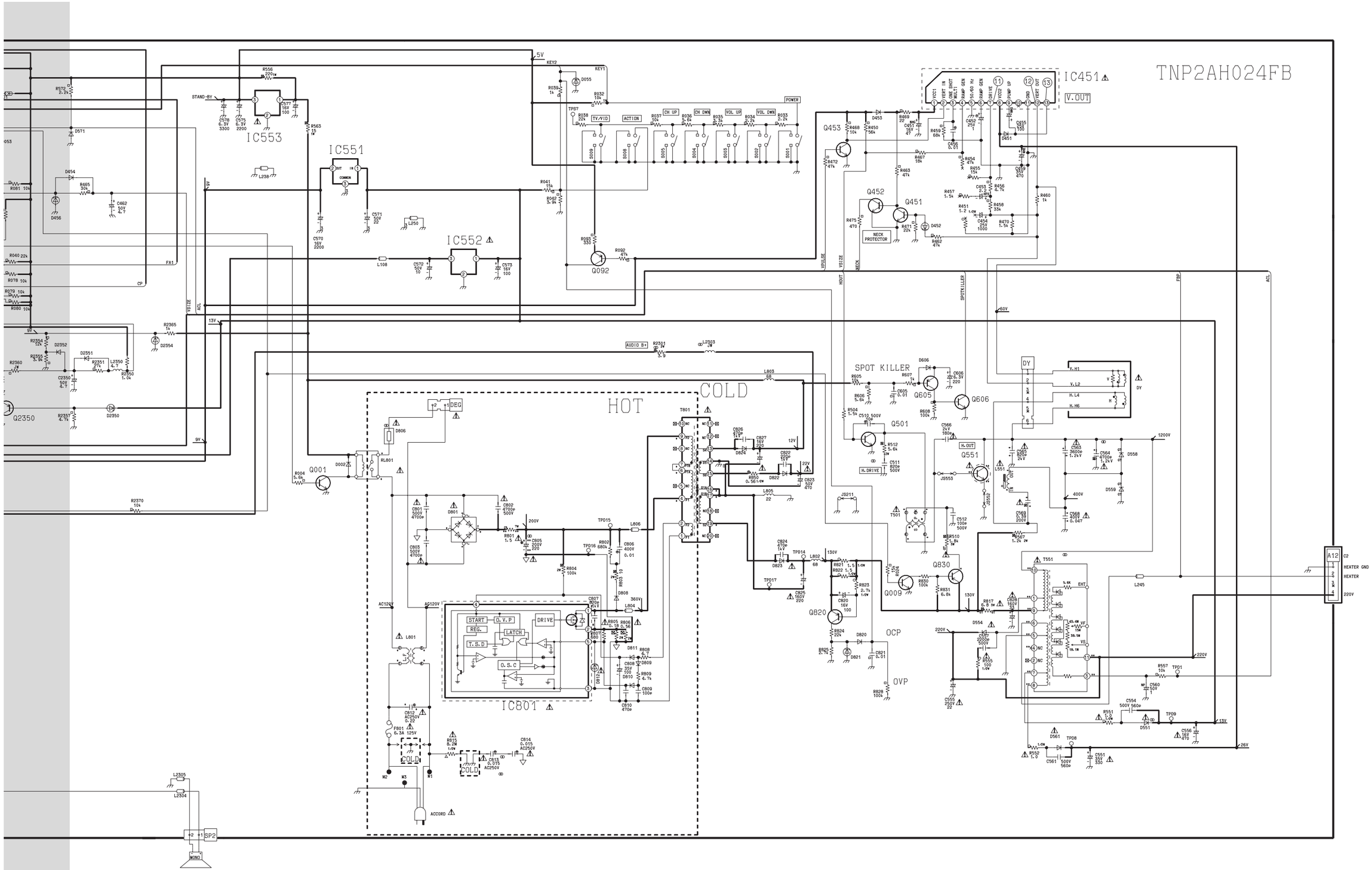
# A-Board Schematic Left Portion -- Diagrama Eléctrico Tarjeta-A Porcion Izquierda



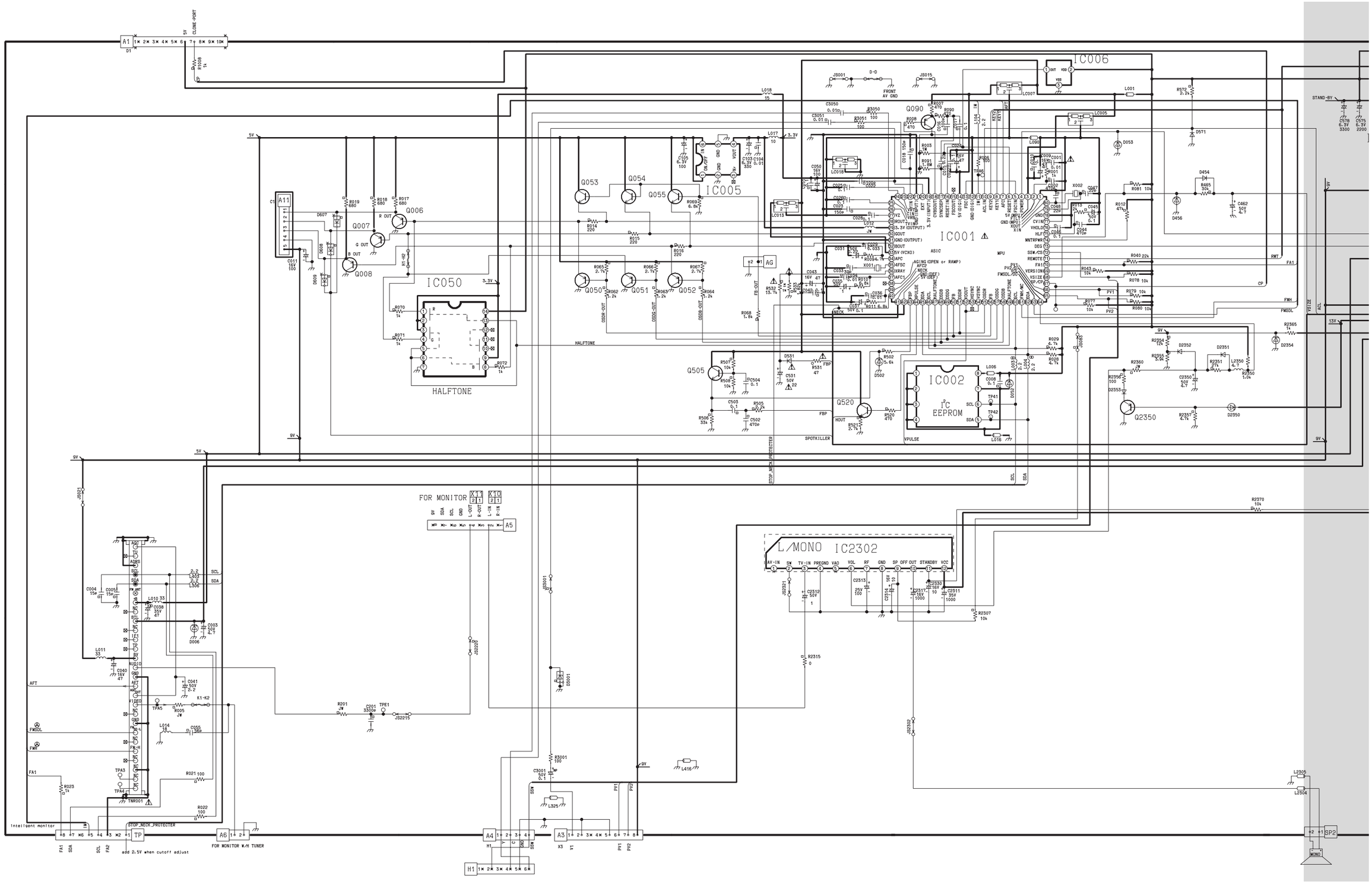

TNP2AH024EN
A
IC451
V.OUT
IC553
IC552
IC551
IC801
Q092
Q001
Q451
Q452
Q453
Q501
Q551
Q605
Q606
Q820
Q830
Q009
SPOT KILLER
OCP
OVP
COLD
HOT
DEG
ACCORD
NECK PROTECTOR
H. DRIVE
H. OUT
START
REG.
LATCH
DRIVE
T.S.D
O.S.C
O.V.P
STAND-BY
TV/VID
ACTION
CH UP
CH DWN
VOL UP
VOL DWN
POWER
AUDIO B+
SP2
MONO
HEATER GND
HEATER
220V

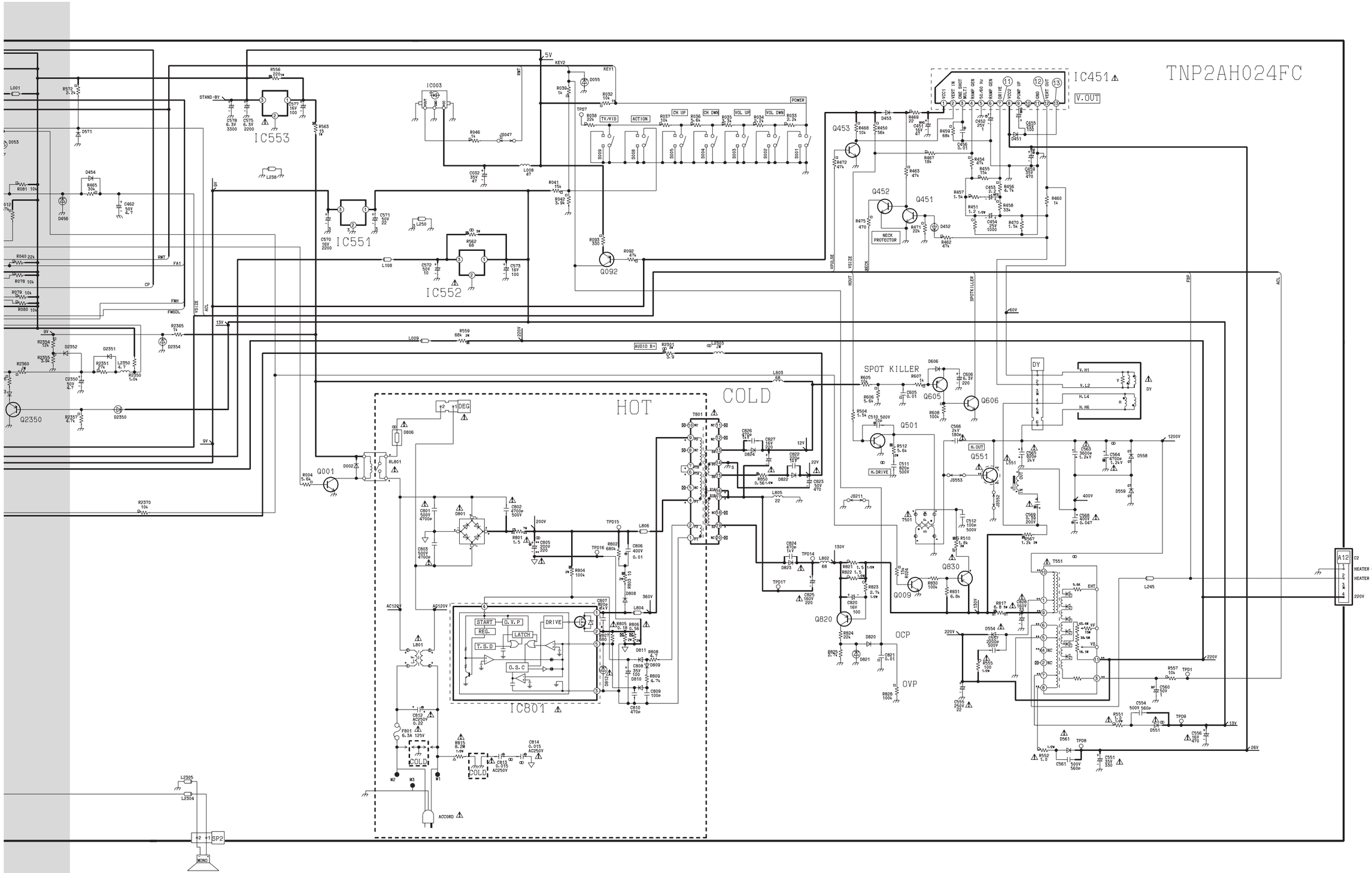
# A-Board Schematic Left Portion -- Diagrama Eléctrico Tarjeta-A Porcion Izquierda



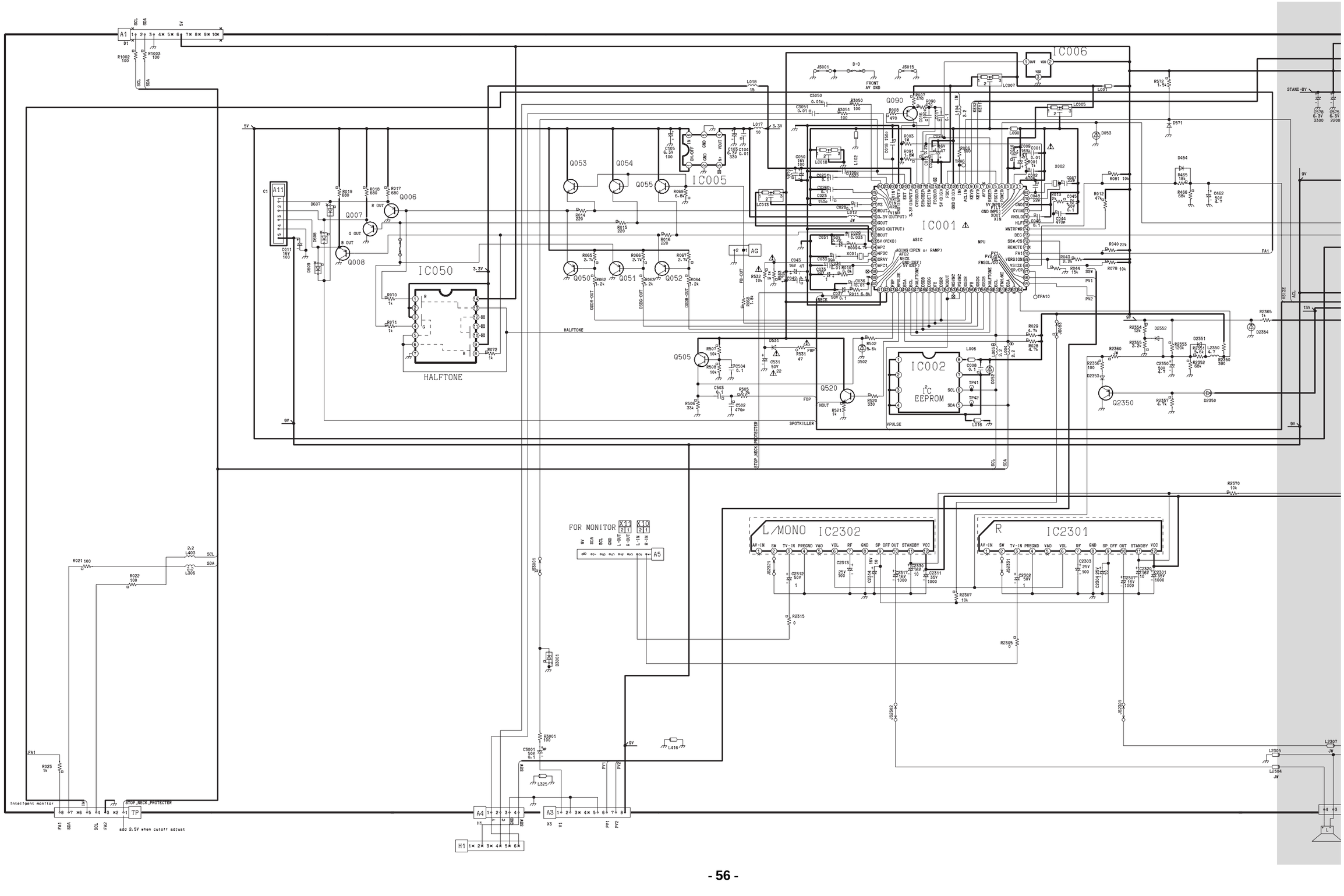

TNP2AH024FB
IC451
V.OUT
IC553
IC551
IC552
IC801
Q092
Q452
Q451
Q453
NECK PROTECTOR
SPOT KILLER
Q605
Q606
Q501
Q551
Q009
Q830
Q820
OCP
OVP
HOT
COLD
DY
H.OUT
H.DRIVE
POWER
CH UP
CH DWN
VOL UP
VOL DWN
TV/VID
ACTION
KEY1
KEY2
5V
9V
13V
26V
60V
200V
220V
400V
1200V
AUDIO B+
AC120V
STAND-BY
SP2
MONO
HEATER GND
HEATER
220V

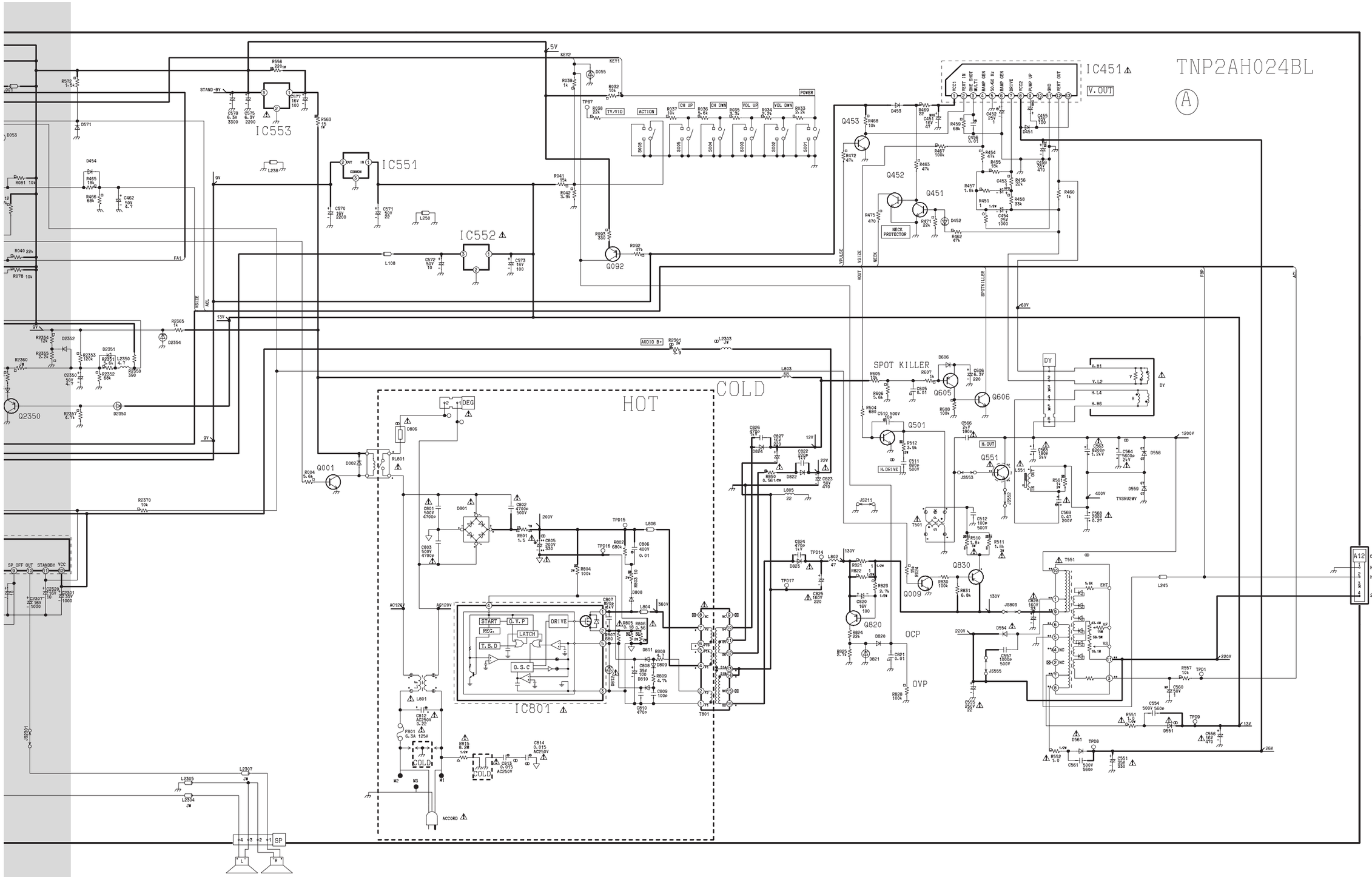
# A-Board Schematic Left Portion -- Diagrama Eléctrico Tarjeta-A Porcion Izquierda



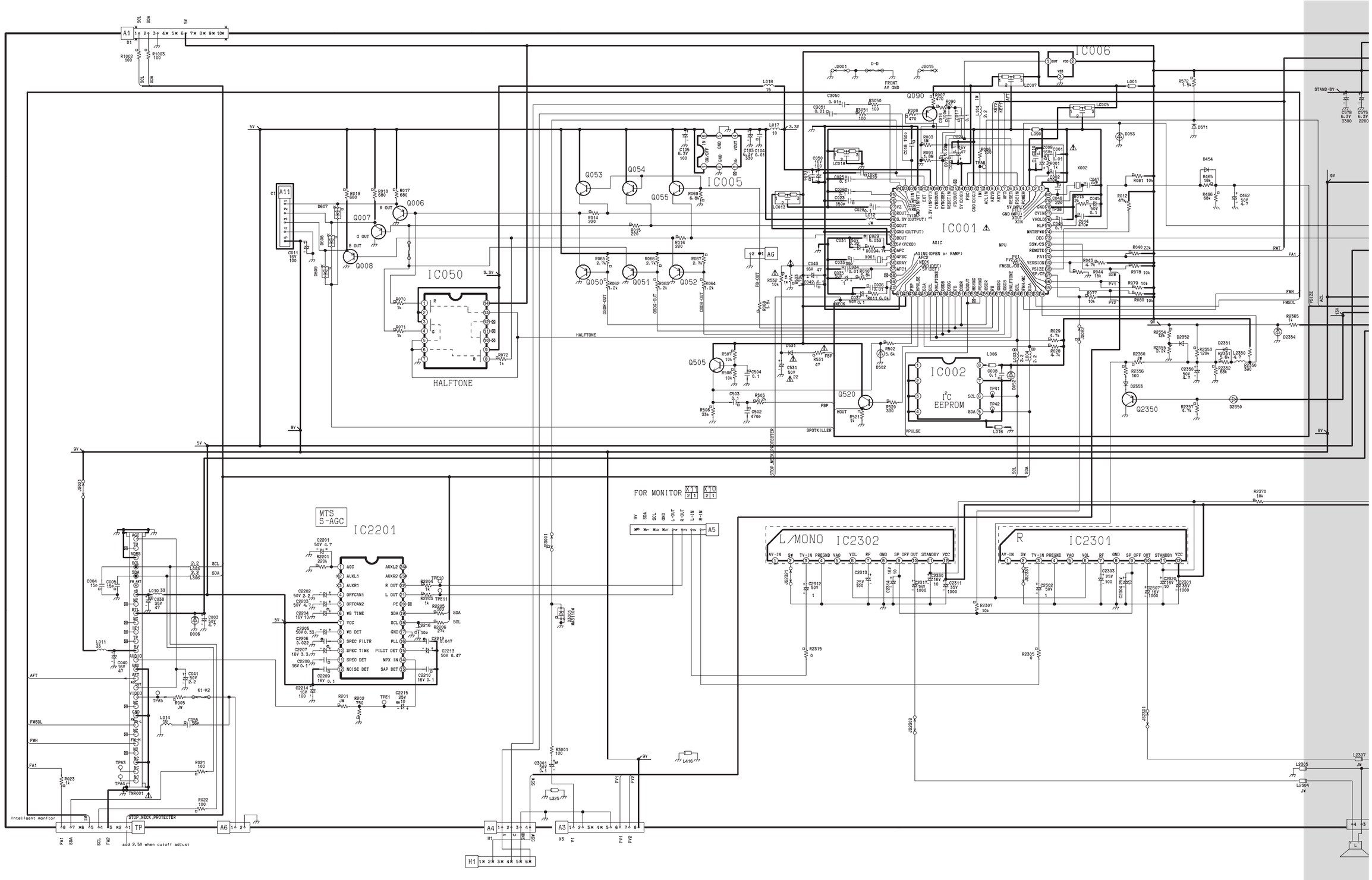

TNP2AH024FC
IC451
V.OUT
IC553
IC551
IC552
IC801
IC003
Q092
Q451
Q452
Q453
Q501
Q551
Q606
Q820
Q830
Q009
Q001
Q2350
SPOT KILLER
HOT
COLD
OCP
OVP
NECK PROTECTOR
H.DRIVE
H.OUT
DEG
ACCORD
STAND-BY
POWER
TV/VID
ACTION
CH UP
CH DWN
VOL UP
VOL DWN
START
REG.
LATCH
T.S.D
O.S.C
DRIVE
O.V.P
A12
HEATER GND
HEATER
220V

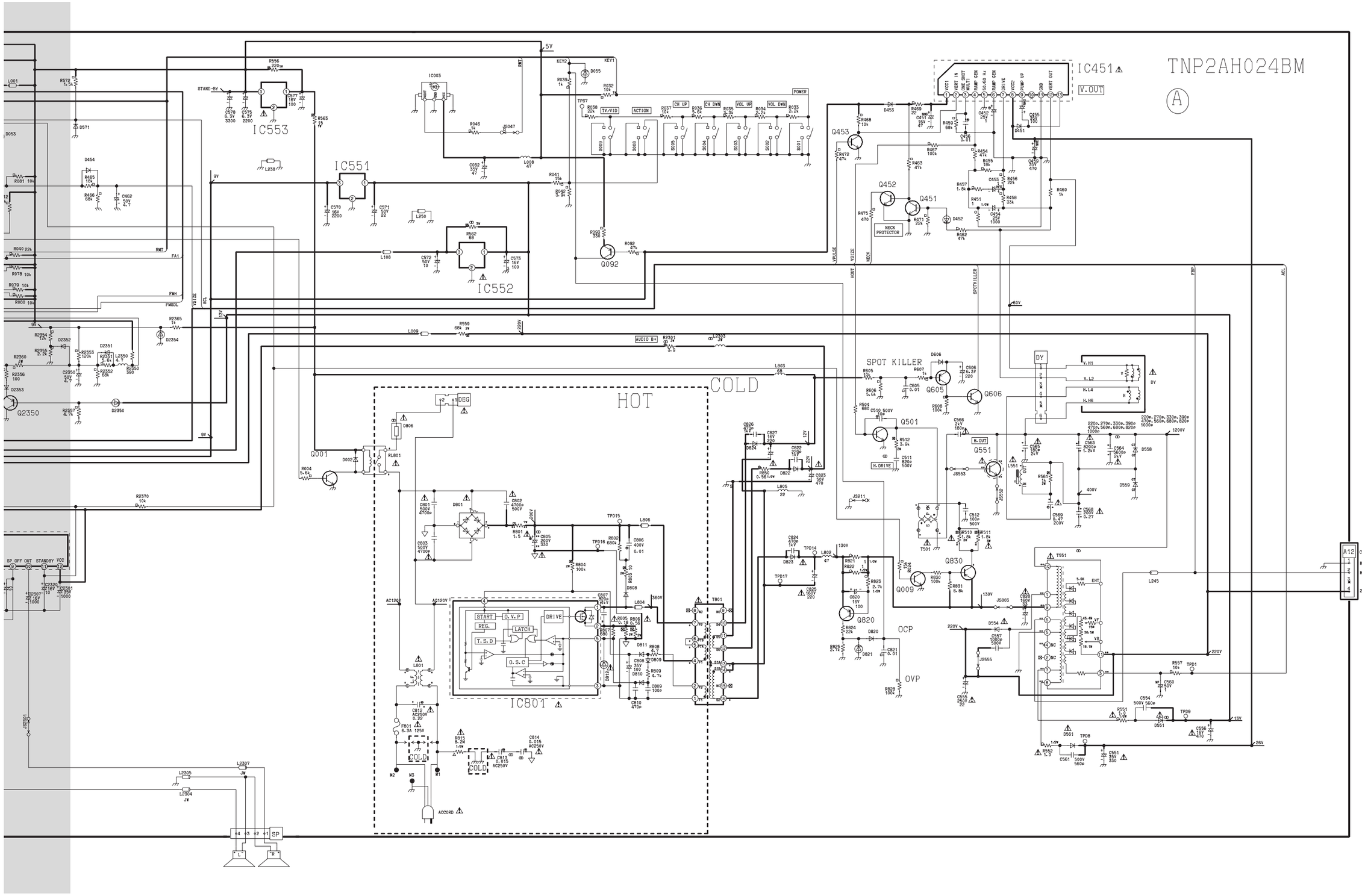
# A-Board Schematic Left Portion -- Diagrama Eléctrico Tarjeta-A Porcion Izquierda



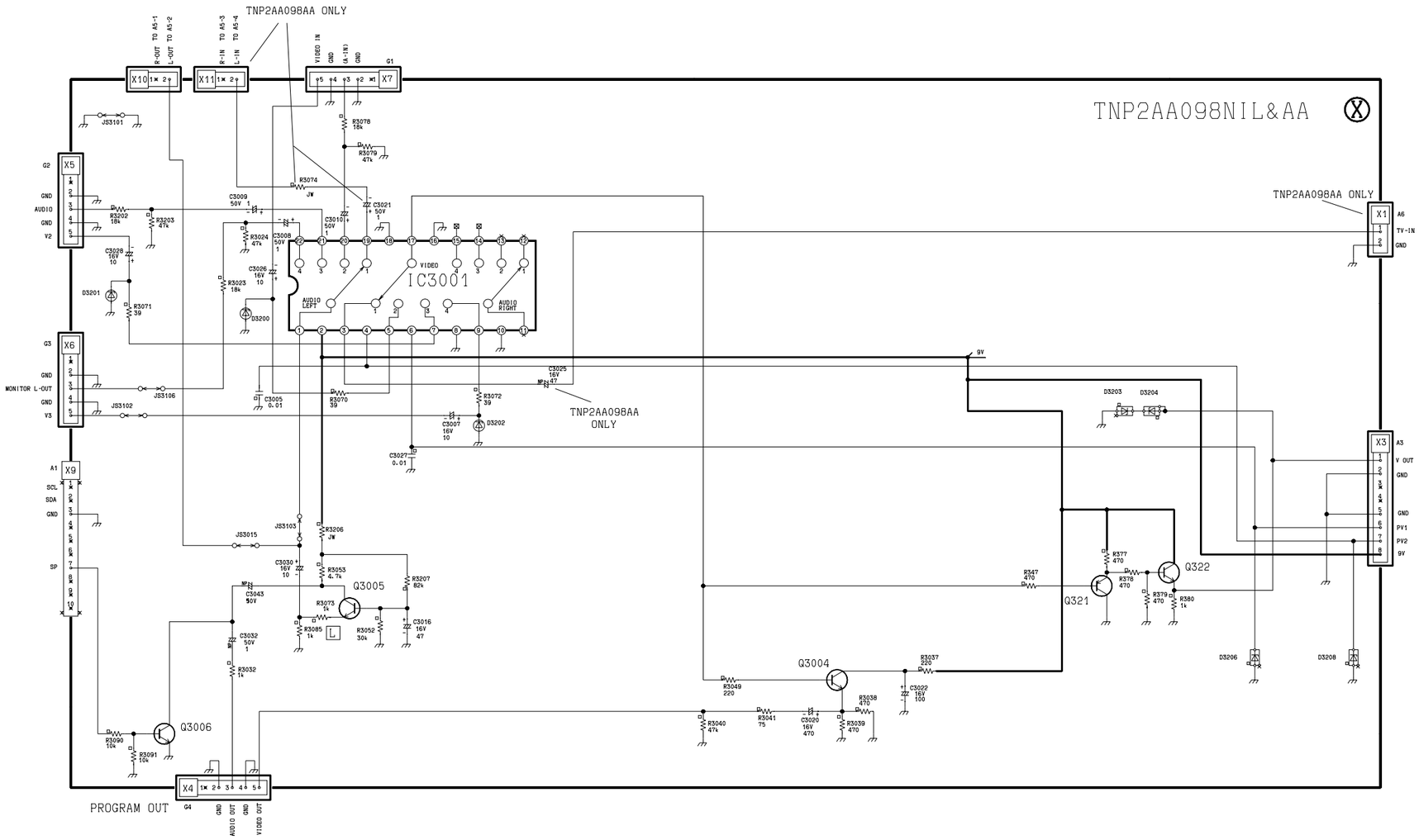

TNP2AH024BL
A
IC451
V. OUT
IC553
IC551
IC552
IC801
Q092
Q453
Q452
Q451
Q2350
Q001
Q501
Q605
Q606
Q551
Q009
Q830
Q820
SPOT KILLER
COLD
HOT
DEG
NECK PROTECTOR
H. OUT
H. DRIVE
OCP
OVP
START
G.V.P
REG.
T.S.D
LATCH
DRIVE
O.S.C
STAND-BY
AUDIO B+
SP OFF OUT
STANDBY
VCC
SP
L
R
ACCORD
TVSRU2MV
5V
9V
13V
26V
60V
130V
200V
220V
400V
1200V

# A-Board Schematic Left Portion -- Diagrama Eléctrico Tarjeta-A Porcion Izquierda




TNP2AH024BM
A
IC451
V.OUT
IC553
IC551
IC552
IC801
HOT
COLD
SPOT KILLER
NECK PROTECTOR
OCP
OVP
START
O.V.P
REG.
LATCH
DRIVE
T.S.D
O.S.C
H.DRIVE
H.OUT
DY
STAND-BY
AUDIO B+
ACCORD
SP OFF OUT
STANDBY
VCC
SP
HEATER GND
HEATER
220V

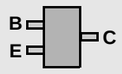
## X-Board Schematics -- Diagrama Eléctrico Tarjeta-X




## X-Board IC Voltages

| IC3001 | |
|---|---|
| 1 | 4.10 |
| 2 | 8.93 |
| 3 | 3.37 |
| 4 | 0.00 |
| 5 | 3.37 |
| 6 | 0.00 |
| 7 | 3.37 |
| 8 | 0.0 |
| 9 | 3.38 |
| 10 | 0.00 |
| 11 | 4.06 |
| 12 | 4.74 |
| 13 | 4.76 |
| 14 | 4.76 |
| 15 | 4.76 |
| 16 | 0.00 |
| 17 | 3.97 |
| 18 | 0.00 |
| 19 | 4.77 |
| 20 | 4.79 |
| 21 | 4.79 |
| 22 | 4.79 |

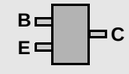
**IDENTIFICACIÓN DE TERMINALES PARA TRANSISTORES EN *CHIP***



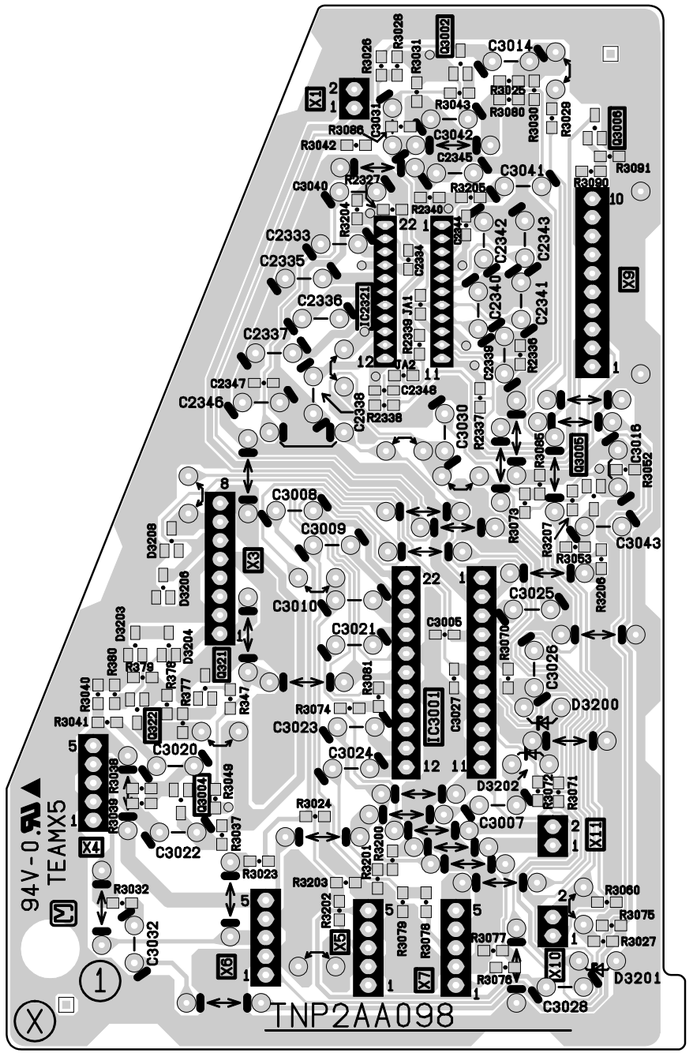

## X-Board Transistors Voltages

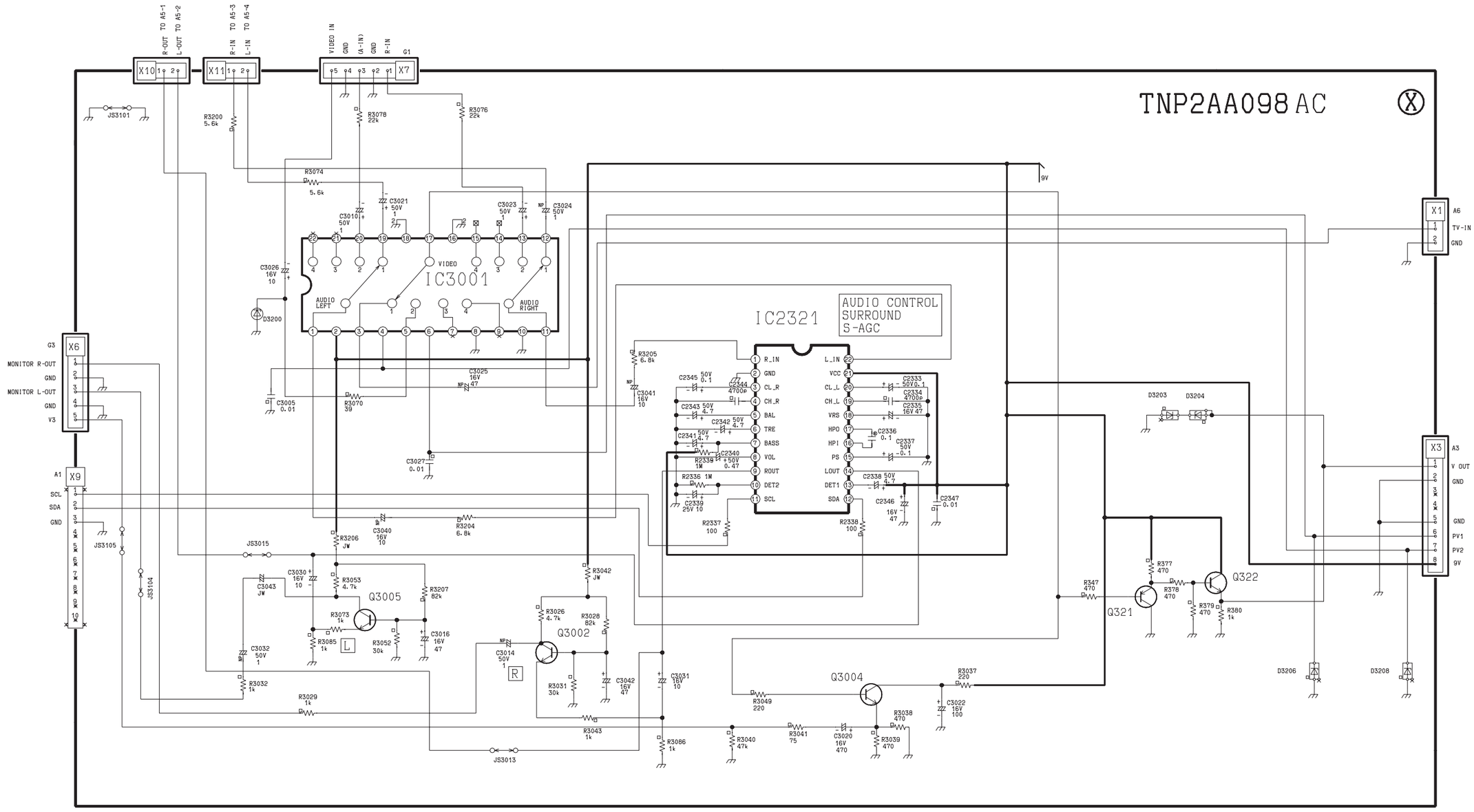
| | Q3004 | Q3005 | Q3006 | Q321 | Q322 |
|---|---|---|---|---|---|
| B | 3.96 | 2.34 | 0.00 | 3.98 | 2.30 |
| C | 5.91 | 4.89 | 0.50 | 0.00 | 8.93 |
| E | 3.27 | 1.71 | 0.00 | 4.66 | 1.68 |

**CHIP TRANSISTOR LEAD DESIGNATION**

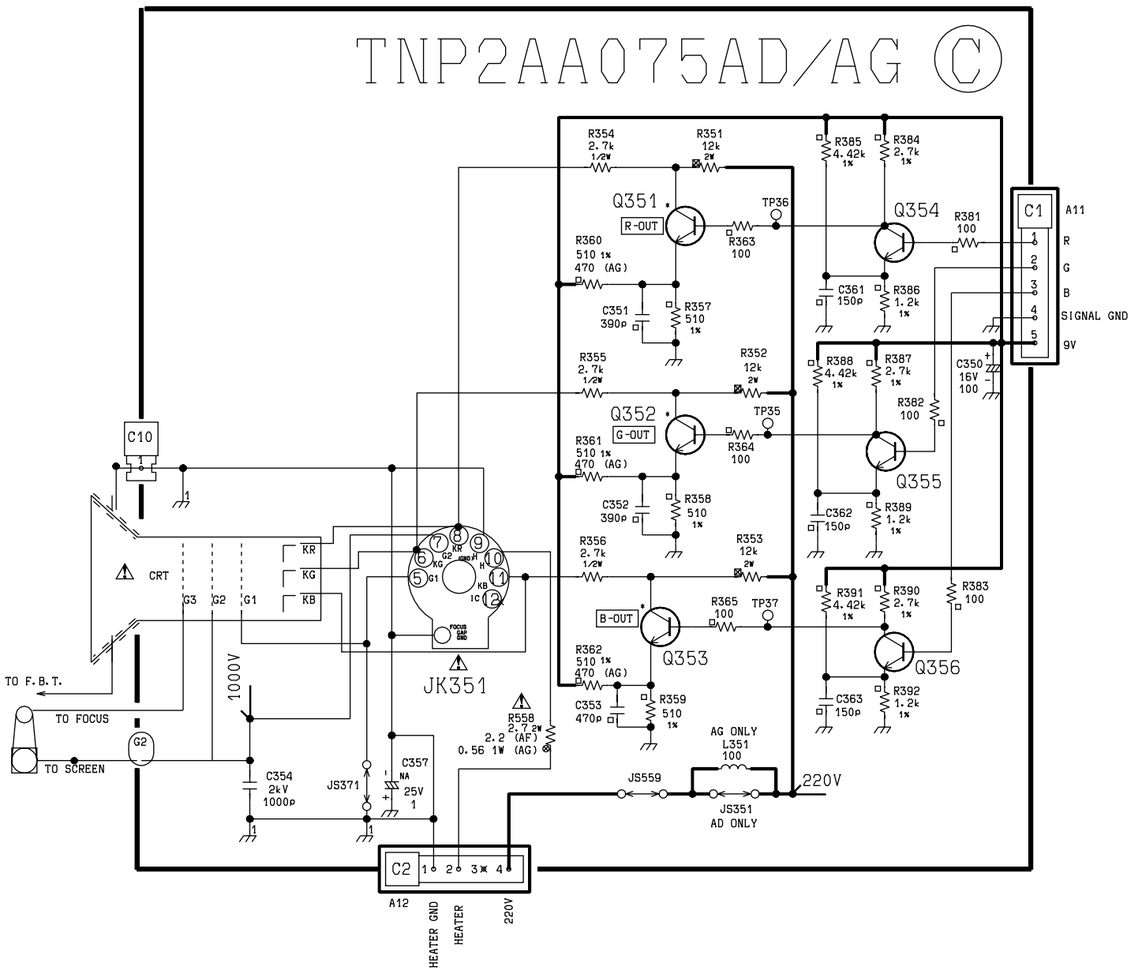


## X-Board Layout -- Diagrama Impreso Tarjeta-X

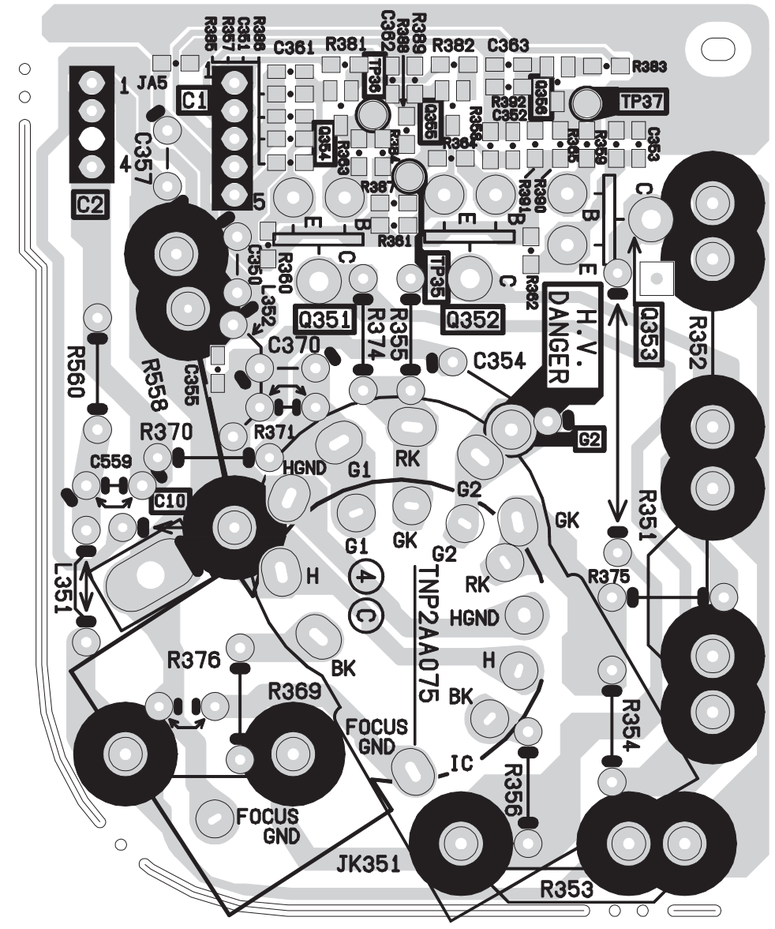

TNP2AA098
94V-0
TEAMX5
X1
X2
X3
X4
X5
X6
X7
X9
X10
X11
IC2321
IC3001
D3200
D3201
D3202
D3203
D3204
D3206
D3208
C3014
C3008
C3009
C3010
C3021
C3025
C3026
C3028
C3023
C3024
C3022
C3007
C3043
C3018
C3030
C3041
C2345
C2333
C2335
C2336
C2337
C2347
C2346
C2338
C2348
C2339
C2340
C2341
C2342
C2343
R3026
R3028
R3031
R3043
R3080
R3030
R3029
R3042
R3091
R3090
R3095
R3053
R3207
R3206
R3074
R3061
R3027
R3075
R3060
R3077
R3076
R3032
R3037
R3023
R3024
R3200
R3201
R3202
R3203
R3071
R3072
R3049
R3039
R3040
R3041
R380
R379
R378
R377
R347
R3204
R3205
R2340
R2339
R2338
R2337
R3079
R3078
C3027
C3005
C3004
C3032
C3031
C3042
C3040
C2344
C2334
C2335
C2321
C2339
C2338
C2337
C2336
C2341
C2342
C2343
C2340
C2345
C2348
C2347
C2346
C3030
C3018
C3043
C3025
C3026
C3028
C3027
C3005
C3021
C3010
C3023
C3024
C3022
C3007
C3020
C3004
C3032
C3031
C3042
C3040
C3041
C3014
C3008
C3009
C3043
C3018
C3030


TNP2AA098 AC
X
X10
X11
X7
X6
X9
X1
X3
R-OUT
L-OUT
R-IN
L-IN
VIDEO IN
GND
(A-IN)
G1
TO A5-1
TO A5-2
TO A5-3
TO A5-4
JS3101
R3200 5.6k
R3078 22k
R3076 22k
R3074 5.6k
C3021 50V 1
C3010 50V 1
C3023 50V 1
C3024 50V 1
C3026 16V 10
D3200
IC3001
VIDEO
AUDIO LEFT
AUDIO RIGHT
C3005 0.01
C3025 16V 47
R3070 39
C3027 0.01
R3205 6.8k
C3041 16V 10
IC2321
AUDIO CONTROL
SURROUND
S-AGC
R_IN
GND
CL_R
CH_R
BAL
TRE
BASS
VOL
ROUT
DET2
SCL
L_IN
VCC
CL_L
CH_L
VRS
HPO
HPI
PS
LOUT
DET1
SDA
C2345 50V 0.1
C2344 4700P
C2343 50V 4.7
C2342 50V 4.7
C2341 50V 4.7
C2339 25V 10
C2340 50V 0.47
R2339 1M
R2336 1M
R2337 100
R2338 100
C2333 50V 0.1
C2334 4700P
C2335 16V 47
C2336 0.1
C2337 50V 0.1
C2338 50V 4.7
C2346 16V 47
C2347 0.01
9V
TV-IN
GND
A6
A3
V OUT
GND
GND
PV1
PV2
9V
D3203
D3204
D3206
D3208
R377 470
R378 470
R379 470
R380 1k
Q322
Q321
R347 470
MONITOR R-OUT
GND
MONITOR L-OUT
GND
V3
SCL
SDA
GND
JS3105
JS3104
JS3015
JS3013
C3030 16V 10
C3043 JW
R3053 4.7k
R3207 82k
Q3005
R3073 1k
R3085 1k
R3052 30k
C3016 16V 47
C3032 50V 1
R3032 1k
R3029 1k
R3206 JW
C3040 16V 10
R3204 6.8k
R3042 JW
R3026 4.7k
R3028 82k
Q3002
C3014 50V 1
R3031 30k
C3042 16V 47
C3031 16V 10
R3043 1k
R3086 1k
R3040 47k
R3041 75
C3020 16V 470
Q3004
R3049 220
R3037 220
C3022 16V 100
R3038 470
R3039 470
L
R

## C-Board Schematic (CT-2088YD, CT-2089VYD, CT-2788YD, CT-2789VYD)



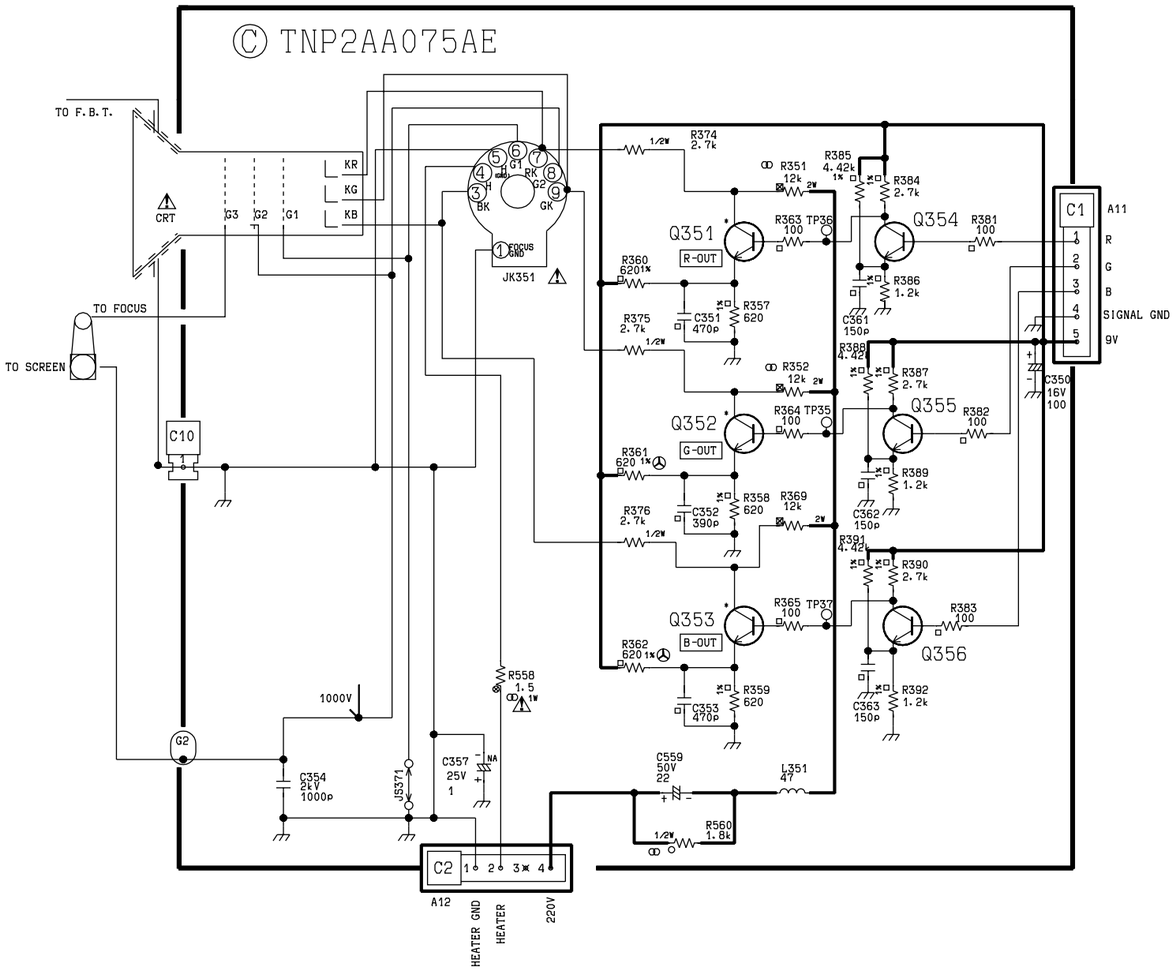

## C-Board Layout




## C-Board voltages

| | Q351 | Q352 | Q353 | Q354 | Q355 | Q356 |
|---|---|---|---|---|---|---|
| B | 6.60 | 6.40 | 6.50 | 3.38 | 3.38 | 3.32 |
| C | 163.30 | 165.30 | 164.00 | 6.58 | 6.41 | 6.49 |
| E | 6.10 | 6.10 | 6.00 | 2.74 | 2.80 | 2.76 |

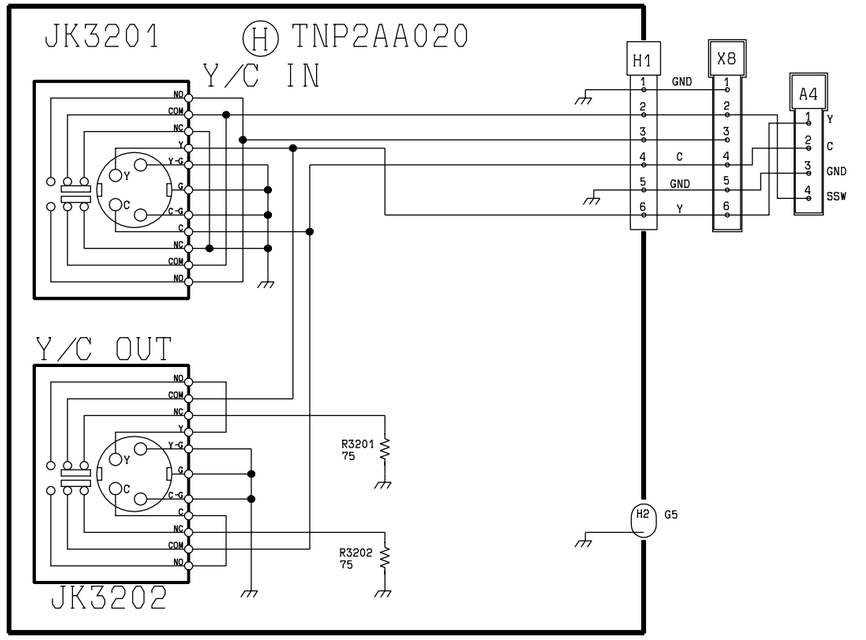
## C-Board Schematic (CT-1388YD, CT-1389VYD)



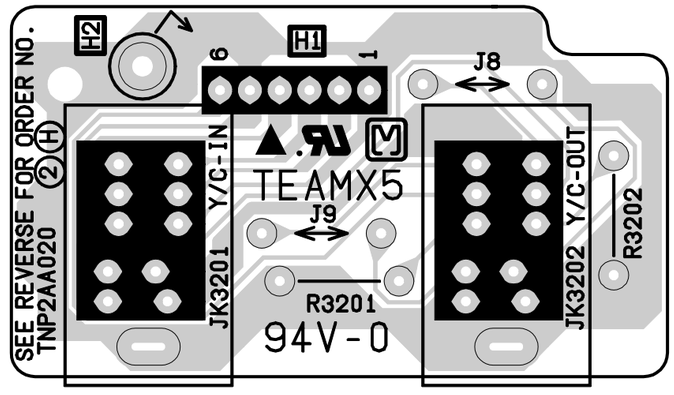

## C-Board voltages

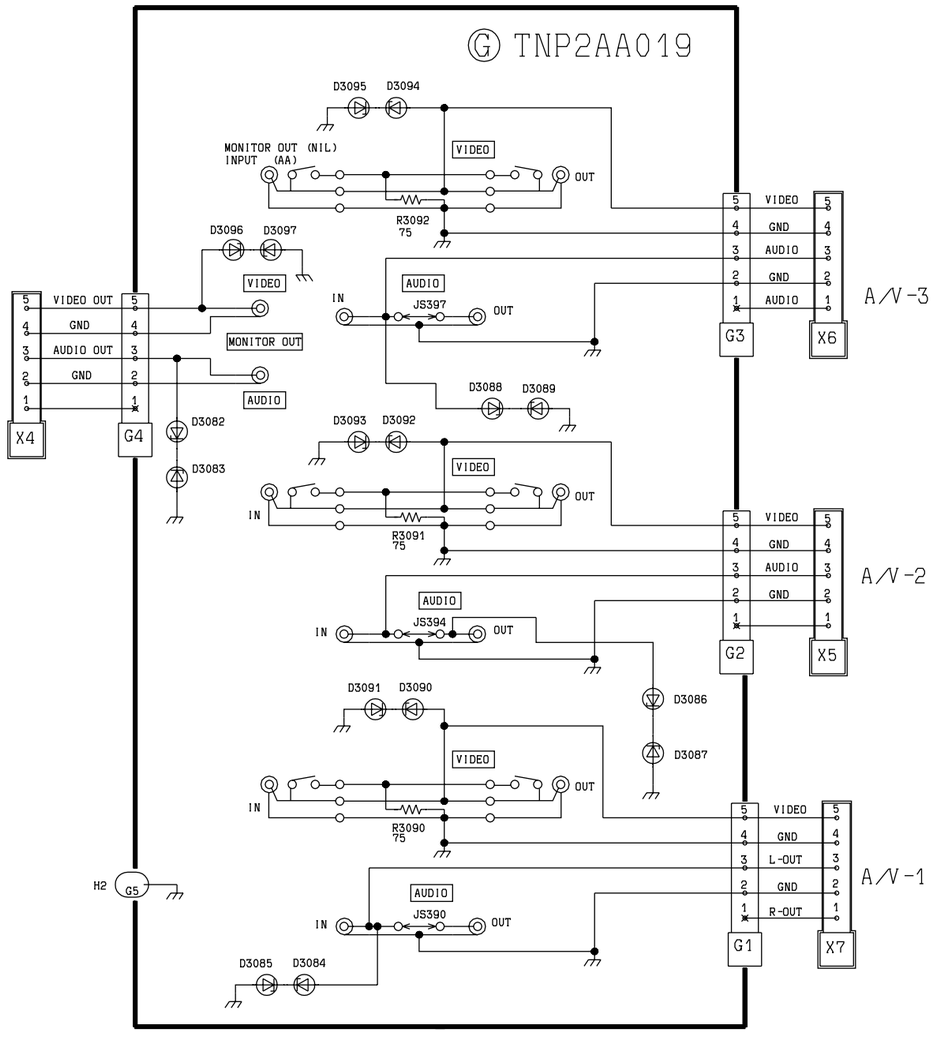
| | Q351 | Q352 | Q353 | Q354 | Q355 | Q356 |
|---|---|---|---|---|---|---|
| B | 6.45 | 6.20 | 6.40 | 3.30 | 3.40 | 3.40 |
| C | 112.00 | 122.20 | 113.50 | 6.40 | 6.20 | 6.50 |
| E | 5.90 | 5.70 | 5.90 | 2.70 | 2.90 | 2.80 |

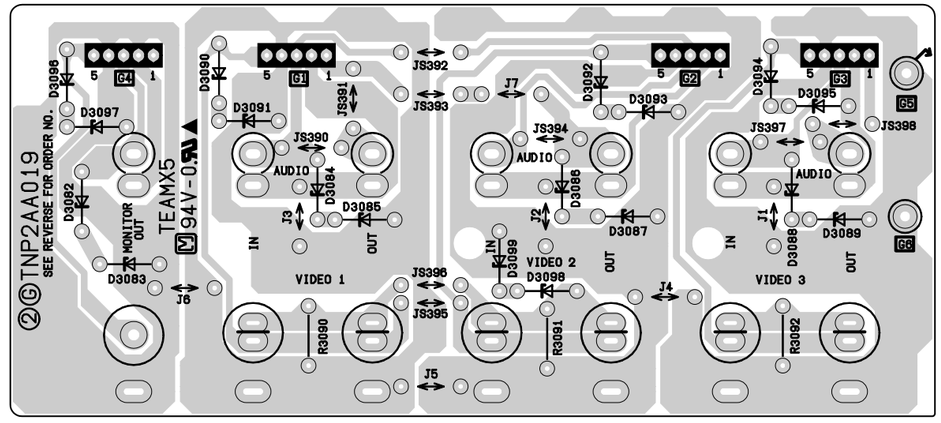
## H-Board Schematic




## H-Board Layout

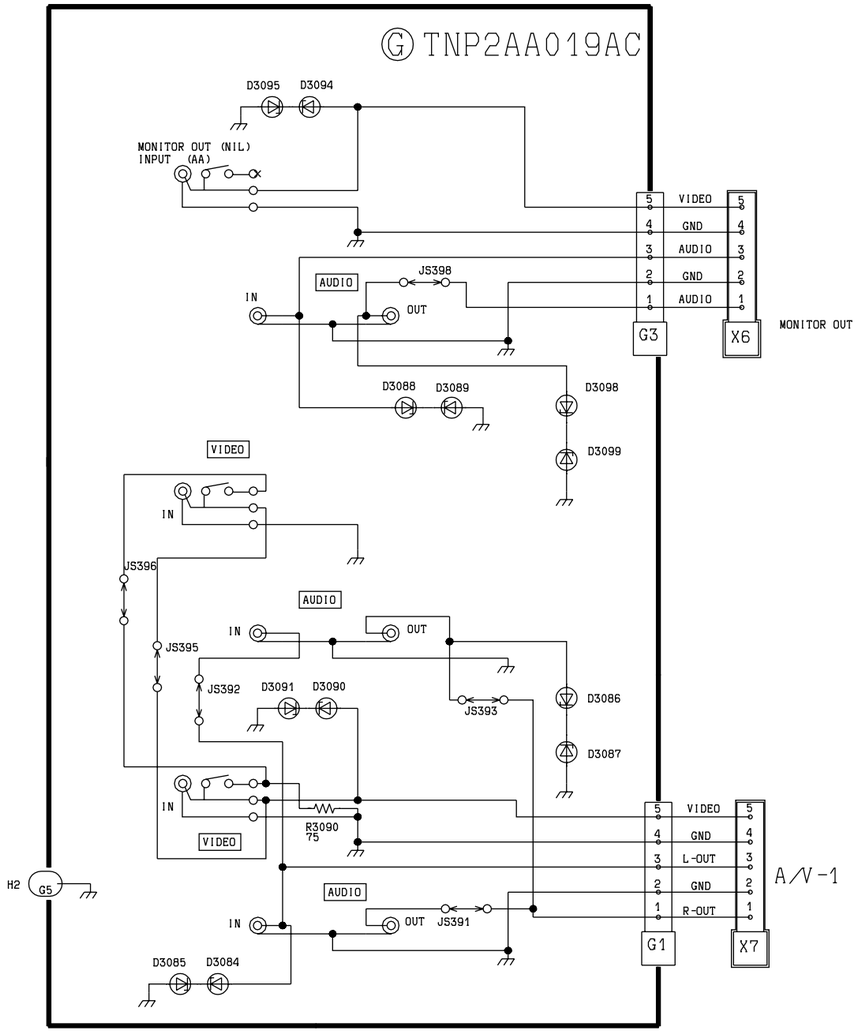



Ⓖ TNP2AA019
D3095
D3094
MONITOR OUT (NIL)
INPUT (AA)
VIDEO
OUT
R3092
75
D3096
D3097
VIDEO
AUDIO
IN
JS397
OUT
VIDEO OUT
GND
AUDIO OUT
GND
MONITOR OUT
AUDIO
X4
G4
D3082
D3083
D3088
D3089
D3093
D3092
VIDEO
IN
OUT
R3091
75
AUDIO
JS394
IN
OUT
D3091
D3090
VIDEO
IN
OUT
R3090
75
AUDIO
JS390
IN
OUT
D3085
D3084
H2
G5
D3086
D3087
VIDEO
GND
AUDIO
GND
AUDIO
G2
X5
VIDEO
GND
L-OUT
GND
R-OUT
G1
X7
A/V-3
A/V-2
A/V-1

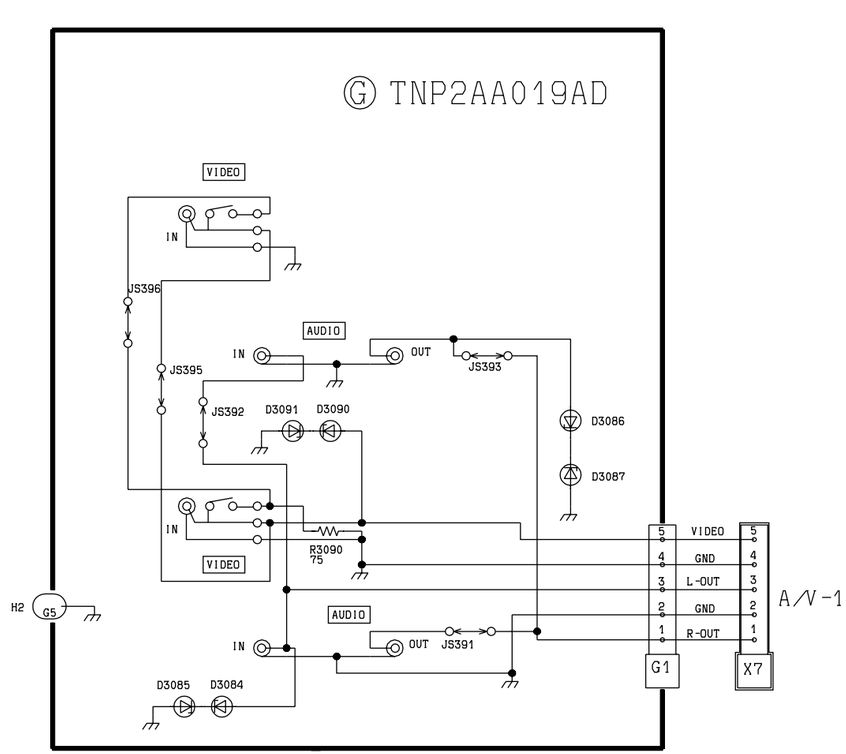

Ⓖ TNP2AA019
SEE REVERSE FOR ORDER NO.
TEAMX5
94V-0
G4
G1
G2
G3
G5
G6
D3096
D3097
D3082
MONITOR OUT
D3083
J6
D3090
D3091
JS391
JS390
AUDIO
D3084
D3085
J3
IN
OUT
VIDEO 1
R3090
JS392
JS393
J7
D3092
D3093
JS394
AUDIO
D3086
J2
D3087
D3099
IN
VIDEO 2
OUT
D3098
JS396
JS395
J5
R3091
J4
D3094
D3095
JS397
JS398
AUDIO
D3088
D3089
J1
IN
OUT
VIDEO 3
R3092

# G-Board Schematic - Diagrama Eléctrico Tarjeta-G

## G-Board CT-2789VYD




## G-Board CT-2788YD



## A-Board Voltages

### IC001

| | | | |
|---|---|---|---|
| 1 | 0.00 | 41 | 0.00 |
| 2 | 1.20 | 42 | 5.00 |
| 3 | 5.00 | 43 | 0.00 |
| 4 | 4.95 | 44 | 1.75 |
| 5 | 2.21 | 45 | 4.06 |
| 6 | 5.00 | 46 | 3.68 |
| 7 | 1.48 | 47 | 0.00 |
| 8 | 5.01 | 48 | 5.00 |
| 9 | 2.72 | 49 | 5.00 |
| 10 | 2.24 | 50 | 0.00 |
| 11 | 4.97 | 51 | 5.00 |
| 12 | 0.00 | 52 | 0.00 |
| 13 | 2.51 | 53 | 0.48 |
| 14 | 5.00 | 54 | 0.00 |
| 15 | 2.49 | 55 | 5.00 |
| 16 | 5.00 | 56 | 0.00 |
| 17 | 2.85 | 57 | 5.00 |
| 18 | 1.19 | 58 | 5.00 |
| 19 | 3.23 | 59 | 0.00 |
| 20 | 0.88 | 60 | 3.69 |
| 21 | 0.00 | 61 | 0.00 |
| 22 | 0.52 | 62 | 4.09 |
| 23 | 1.72 | 63 | 0.65 |
| 24 | 1.09 | 64 | 0.25 |
| 25 | 0.45 | 65 | 0.00 |
| 26 | 0.53 | 66 | 0.00 |
| 27 | 2.04 | 67 | 0.00 |
| 28 | 2.64 | 68 | 0.65 |
| 29 | 3.29 | 69 | 0.78 |
| 30 | 2.78 | 70 | 1.35 |
| 31 | 0.00 | 71 | 4.67 |
| 32 | 2.69 | 72 | 0.00 |
| 33 | 5.00 | 73 | 0.00 |
| 34 | 2.83 | 74 | 4.99 |
| 35 | 2.58 | 75 | 2.05 |
| 36 | 2.69 | 76 | 0.30 |
| 37 | 2.41 | 77 | 1.94 |
| 38 | 3.51 | 78 | 0.00 |
| 39 | 3.64 | 79 | 2.18 |
| 40 | 2.51 | 80 | 2.18 |

### IC002

| | |
|---|---|
| 1 | 0.00 |
| 2 | 0.00 |
| 3 | 0.00 |
| 4 | 0.00 |
| 5 | 4.12 |
| 6 | 2.88 |
| 7 | 0.00 |
| 8 | 5.02 |

### IC003

| | |
|---|---|
| 1 | 4.90 |
| 2 | 0.00 |
| 3 | 5.01 |

### IC005

| | |
|---|---|
| 1 | 5.01 |
| 2 | 0.00 |
| 3 | 1.30 |
| 4 | 3.29 |
| 5 | 0.00 |
| 6 | 5.01 |

### IC006

| | |
|---|---|
| 1 | 5.00 |
| 2 | 5.00 |
| 3 | 0.00 |

### IC050

| | |
|---|---|
| 1 | 2.65 |
| 2 | 3.09 |
| 3 | 3.23 |
| 4 | 2.78 |
| 5 | 0.00 |
| 6 | 0.00 |
| 7 | 0.00 |
| 8 | 2.69 |
| 9 | 3.23 |
| 10 | 0.00 |
| 11 | 0.00 |
| 12 | 0.00 |
| 13 | 0.00 |
| 14 | 5.02 |

### IC2302

| | |
|---|---|
| 1 | 13.71 |
| 2 | 0.00 |
| 3 | 13.76 |
| 4 | 0.00 |
| 5 | 9.98 |
| 6 | 1.98 |
| 7 | 17.26 |
| 8 | 0.00 |
| 9 | 4.99 |
| 10 | 9.10 |
| 11 | 3.54 |
| 12 | 19.12 |

### IC451

| | |
|---|---|
| 1 | 8.22 |
| 2 | 8.65 |
| 3 | 4.11 |
| 4 | 4.18 |
| 5 | 0.00 |
| 6 | 4.15 |
| 7 | 3.78 |
| 8 | 22.71 |
| 9 | 1.77 |
| 10 | 1.38 |
| 11 | 0.00 |
| 12 | 4.56 |
| 13 | 23.13 |

### IC551

| | |
|---|---|
| 1 | 13.43 |
| 2 | 0.00 |
| 3 | 8.94 |

### IC552

| | |
|---|---|
| 1 | 13.43 |
| 2 | 0.00 |
| 3 | 5.01 |

### IC553

| | |
|---|---|
| 1 | 8.80 |
| 2 | 0.00 |
| 3 | 5.02 |

### IC801

| | |
|---|---|
| 1 | 98.8 |
| 2 | 0.10 |
| 3 | 0.00 |
| 4 | 31.97 |
| 5 | 1.66 |

| | Q001 | Q006 | Q007 |
|---|---|---|---|
| B | 0.00 | 2.64 | 2.77 |
| C | 11.07 | 0.00 | 0.00 |
| E | 0.00 | 3.31 | 3.44 |

| | Q008 | Q009 | Q050 |
|---|---|---|---|
| B | 2.69 | 0.60 | 4.68 |
| C | 0.00 | 0.00 | 0.00 |
| E | 3.36 | 0.00 | 2.72 |

| | Q051 | Q052 | Q053 |
|---|---|---|---|
| B | 5.00 | 5.00 | 0.00 |
| C | 0.00 | 0.00 | 5.01 |
| E | 2.77 | 2.69 | 2.64 |

| | Q054 | Q055 | Q090 |
|---|---|---|---|
| B | 0.00 | 0.00 | 1.21 |
| C | 5.00 | 5.01 | 0.00 |
| E | 2.77 | 2.69 | 1.90 |

| | Q092 | Q2350 | Q451 |
|---|---|---|---|
| B | 8.89 | 6.61 | 0.61 |
| C | 2.72 | 0.00 | 0.00 |
| E | 5.02 | 1.84 | 1.84 |

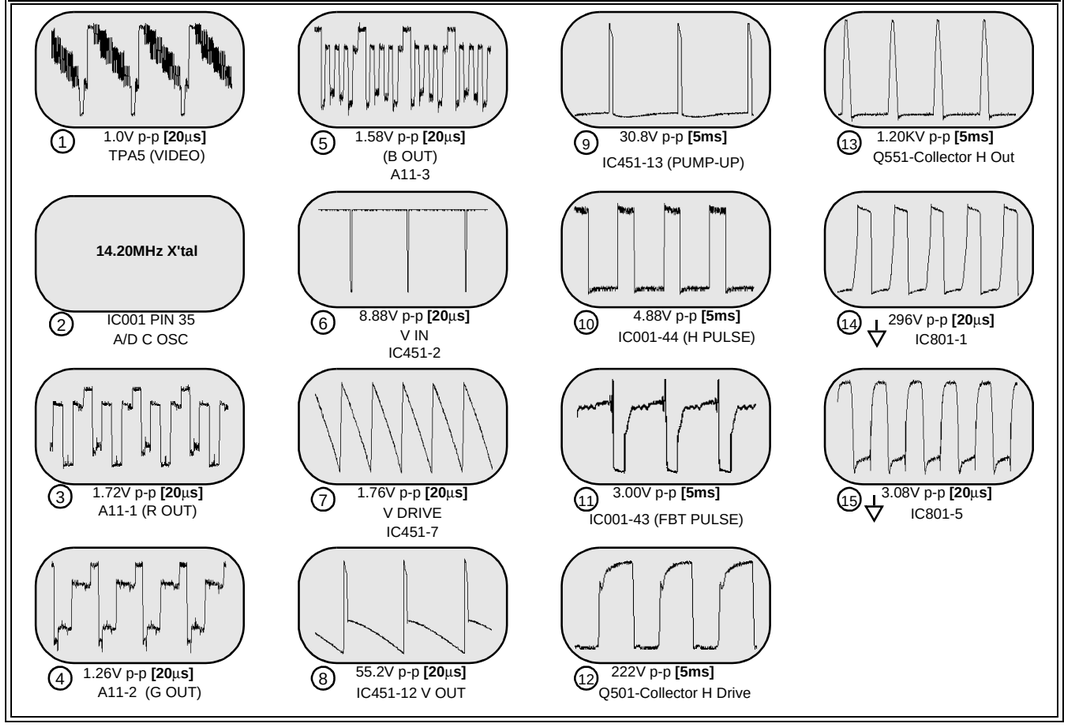
| | Q452 | Q453 | Q501 |
|---|---|---|---|
| B | 0.00 | 0.00 | 0.50 |
| C | 2.52 | 8.70 | 65.30 |
| E | 0.00 | 0.00 | 0.00 |

| | Q505 | Q520 | Q551 |
|---|---|---|---|
| B | 2.48 | 1.75 | 0.00 |
| C | 5.00 | 5.00 | 14.70 |
| E | 2.33 | 1.70 | 0.00 |

| | Q605 | Q606 | Q820 |
|---|---|---|---|
| B | 4.03 | 0.00 | 130.2 |
| C | 0.00 | 3.54 | 0.00 |
| E | 4.01 | 0.00 | 130.5 |

| | Q830 |
|---|---|
| B | 129.5 |
| C | 128.8 |
| E | 130.2 |

## A-Board Waveforms


1 1.0V p-p [20µs] TPA5 (VIDEO)
5 1.58V p-p [20µs] (B OUT) A11-3
9 30.8V p-p [5ms] IC451-13 (PUMP-UP)
13 1.20KV p-p [5ms] Q551-Collector H Out
14.20MHz X'tal
2 IC001 PIN 35 A/D C OSC
6 8.88V p-p [20µs] V IN IC451-2
10 4.88V p-p [5ms] IC001-44 (H PULSE)
14 296V p-p [20µs] IC801-1
3 1.72V p-p [20µs] A11-1 (R OUT)
7 1.76V p-p [20µs] V DRIVE IC451-7
11 3.00V p-p [5ms] IC001-43 (FBT PULSE)
15 3.08V p-p [20µs] IC801-5
4 1.26V p-p [20µs] A11-2 (G OUT)
8 55.2V p-p [20µs] IC451-12 V OUT
12 222V p-p [5ms] Q501-Collector H Drive

## A-Board Voltages (CT-2789VYD)

### IC451

| | |
|---|---|
| 1 | 8.26 |
| 2 | 8.71 |
| 3 | 4.13 |
| 4 | 4.18 |
| 5 | 0.00 |
| 6 | 4.15 |
| 7 | 2.88 |
| 8 | 26.82 |
| 9 | 2.84 |
| 10 | 1.28 |
| 11 | 0.00 |
| 12 | 15.78 |
| 13 | 27.73 |

### IC801

| | |
|---|---|
| 1 | 50.10 |
| 2 | 0.00 |
| 3 | 0.00 |
| 4 | 32.10 |
| 5 | 1.76 |

### IC2201

| | |
|---|---|
| 1 | 1.30 |
| 2 | 2.19 |
| 3 | 2.19 |
| 4 | 2.31 |
| 5 | 2.18 |
| 6 | 0.36 |
| 7 | 4.96 |
| 8 | 2.47 |
| 9 | 2.44 |
| 10 | 0.46 |
| 11 | 2.28 |
| 12 | 3.08 |

### IC2301

| | |
|---|---|
| 1 | 13.24 |
| 2 | 0.00 |
| 3 | 13.27 |
| 4 | 0.00 |
| 5 | 9.51 |
| 6 | 3.98 |
| 7 | 16.69 |
| 8 | 0.00 |
| 9 | 4.97 |
| 10 | 8.35 |
| 11 | 3.06 |
| 12 | 18.44 |
| 13 | 3.35 |
| 14 | 2.18 |
| 15 | 3.36 |
| 16 | 3.48 |
| 17 | 0.00 |
| 18 | 3.24 |
| 19 | 3.55 |
| 20 | 0.00 |
| 21 | 2.24 |
| 22 | 2.20 |
| 23 | 2.19 |
| 24 | 2.19 |

NOTES

## NOTES:

Panasonic®

Printed in USA
K01100600PL1016